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# ARCHIVES OF PHYSICAL THERAPY, X-RAY RADIUM

VOL. VII

OCTOBER, 1926

No. 10

## ROENTGENOLOGIC AID TO THE BRONCHOSCOPIST\*

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IT is essential to state at the beginning that I am not a roentgenologist, that I know practically nothing of the roentgenologic technique. My presentation, therefore, will be limited to clinical cases and I shall mention only points that may possibly be of interest, even if not new, to the roentgenologist. I did not come with a view to teach anyone anything; clinical cases are always of interest and will be presented for what they are worth. Many if not all of the statements in this paper will be platitudes to many if not all the men present. I hope, therefore, that you will be charitable in your criticism.

### DISEASE OF THE ESOPHAGUS

The roentgenologist tells us that the first, and one of the most important steps, in determining the presence of esophageal disease is the observation of the swallowing

function by means of fluoroscopic observation of an opaque mixture passing through the esophagus. Congenital atresia may be shown by injecting the upper esophagus with an opaque mixture which will outline the esophagus above the atresia. Dr. Manges pointed out to us in a recent case that absence of air in the gastro-intestinal tract also gave positive x ray evidence of congenital atresia. Cicatricial stenosis can be localized and the severity and extent definitely determined by the use of an opaque mixture. Compression stenosis can be shown; and aneurysm, which is ordinarily a contra-indication to bronchoscopy except when a foreign body has lodged in the esophagus, can be outlined and the expansile pulsation determined fluoroscopically. Films, if properly timed with the patient in the Manges position, will record the fluoroscopic observations. Pulsion diverticulum can be demonstrated by the filling of the pouch with opaque mixture and the over-

\*Read before the Fourth Annual Meeting of the American College of Physical Therapy, October 21, 1925.

flow passing anteriorly into the subdiverticular esophagus. Traction diverticulum may be also shown. Phrenospasm, or so-called "cardiospasm," gives characteristic dilatation above the level of the diaphragm, but the possibility of the presence of cancer should always be excluded by esophagoscopic examination before dilatation of the stenosis is attempted. Cancer of the esophagus, when obstructive, can be definitely localized by the roentgenologist, and his examination gives to the endoscopist a necessary basis for diagnostic esophagoscopy and the removal of a specimen for biopsy. Retropharyngeal abscess has been recently demonstrated as to localization and extent by Drs. Pancoast and Pendergrass in a se-

ries of six cases. With this aid as to localization the cases were all treated endoscopically with excellent results.

*Foreign Body in the Esophagus and Other Food Passages:* The first step in the study of every suspected foreign body case is the roentgenologic examination. This examination includes the anatomy from the nasopharynx to the tuberosities of the ischium; fluoroscopic and film examination is made. If a foreign body is found in the nasopharynx the complete examination is made to exclude the possibility of multiple foreign body; anteroposterior and lateral views are always made. A coin lying in the coronal plane, in the cervical or upper dor-



Fig. 1.—Congenital atresia of the Esophagus. Roentgenogram, by Dr. Manges, showing opaque mixture in the esophagus above the point of atresia, also, as pointed out by Dr. Manges, absence of air in the intestines, another positive sign.

Fig. 2.—Cicatricial stenosis of the esophagus. Dilatation of the upper esophagus and a long tight stricture of the lower half of the thoracic esophagus, outlined by opaque mixture. Film by Dr. Manges.

Fig. 3.—Pulsion diverticulum. Opaque mixture outlining a pouch downward from the cricoid level. At fluoroscopy the opaque mixture was seen to overflow and pass anterior to the pouch downward through the cervical esophagus into the stomach without hesitation. Film by Dr. Pancoast.

Fig. 4.—Traction diverticulum. Pouch is outlined in the thoracic esophagus by opaque mixture. Film taken in the Manges position.

Fig. 5.—Roentgenogram with opaque mixture showing dilated esophagus resembling closely in appearance the dilatation of phrenospasm. Dr. Pancoast pointed out an irregularity at the level of the diaphragm. On esophagoscopy ulceration was found and a specimen was removed for biopsy which showed cancer.

Fig. 6.—Retropharyngeal abscess. Lateral film with opaque mixture showing a large retropharyngo-esophageal swelling. The opaque mixture passed through the esophagus, demonstrating the distance the spine (a) is from the posterior esophageal wall (b). This abscess was evacuated esophagoscopically, with complete recovery.



sal region, we know to be in the esophagus. The lateral plane has on a number of occasions told us that there were two coins present in perfect opposition. The examination for safety pins is made in the same way. In addition the patient is rotated in front of the fluoroscope so as to determine the position in which there is the greatest spread of point and keeper. The findings of the roentgenologist in this type of foreign body case give us the basis for the solution of the mechanical problem of the removal of the foreign body. In addition to this we ask the roentgenologist to match up a duplicate of the foreign body from the film examination, so that we may use this duplicate for our special practice preliminary to endoscopic removal of the object. In hook-shaped and irregular foreign bodies the roentgenologic examination carried out in this manner is invaluable. It is our

custom in the clinic never to attempt the solution of the mechanical problem of removal; using a film made several days before the time of operation as the basis of our operation. There is always the possibility that the foreign body may have changed its position or location. Position and location of foreign body are checked up fluoroscopically and by films immediately before endoscopic removal. Foreign bodies in the stomach should be localized by giving an opaque mixture, and making films in the lateral plane. If only the anteroposterior plates are made, it may happen, as it has happened many times in the clinic, that a patient has been sent in for the removal of a foreign body from the stomach when the foreign body was in the intestine overlying the stomach. Gastroscopy should not be attempted until this study has been made. Fish bones and non-

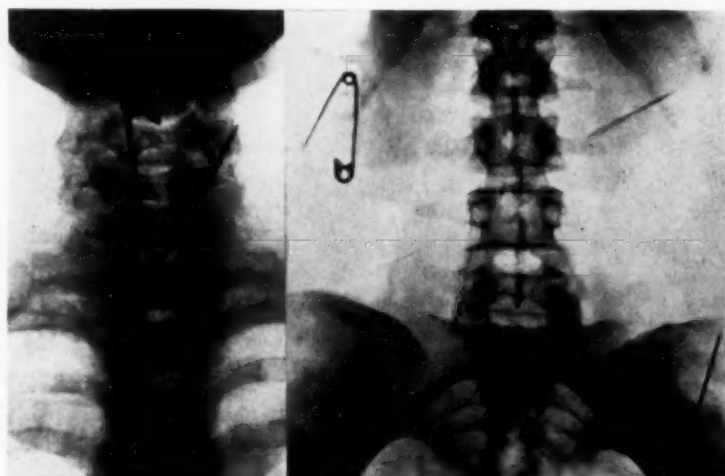


Fig. 7.—(A and B.) Roentgenograms from the nasopharynx to the tuberosities of the ischium showing (a) safety pin in the upper esophagus; (b) safety pin, a needle and a common pin in the abdomen. The pin in the esophagus was removed esophagoscopically. The safety pin and pin in the abdomen passed by bowel, but

laparotomy was necessary for removal of the needle which perforated the bowel, demonstrating the necessity for routine roentgen ray examination from the nasopharynx to the tuberosities of the ischium for the exclusion of multiple foreign body. Films by Dr. Willis F. Manges.

opaque foreign bodies in the esophagus may be localized in many cases by giving an opaque mixture, or a capsule containing an opaque material such as bismuth or barium. If it is thought that there is laceration or ulceration of the esophagus it is preferable to use bismuth subnitrate because of its antiseptic and healing qualities. A fish bone may hold a capsule until it dissolves when the opaque mixture will give no evidence of foreign body. Buttons which are nonopaque to the ray may be outlined in the same manner. In the case of a boy five years of age who was referred to the clinic with a history of having swallowed a button at one year of age, there were reports of several x ray examinations which were negative, prior to admission. Dr. Manges examined the esophagus, using a bismuth solution, and outlined the button beautifully in the mid-thoracic esophagus, from which position it was removed esophagoscopically after a sojourn of four years.

In another patient Dr. Pfahler demonstrated the presence of a bone by giving the patient a capsule containing bismuth. On attempted swallowing of a capsule it seemed lodged in the upper esophagus. A lateral film showed indentation of the capsule, which was found to be due to the bone.

Opaque foreign bodies in the gastrointestinal tract are definitely localized by films and the daily progress noted by fluoroscopic observation. The failure of a pointed foreign body to change position during a period of four or five days may be considered an indication for surgical removal of the foreign body by laparotomy.

#### DISEASE OF THE BRONCHI

The extent of disease of the larynx may be determined in some cases by the presence of abnormal shadows in the larynx, and roentgen ray evidence of metastatic masses in the neck and chest. Narrowing or complete stenosis of the laryngeal air-



Fig. 8.—*Disc-shaped foreign body.* Roentgenograms in the antero-posterior and lateral planes, demonstrating the foreign body in the esophagus. Films by Dr. Henry K. Pancoast. The foreign body lying with the greater axis in the coronal plane is diagnostic of esophageal foreign body.

Fig. 9.—*Irregular foreign body.* Anteroposterior and lateral films demonstrating hooks on both surfaces of a tooth-plate in the cervical esophagus. These films were invaluable as a basis for the solution of the mechanical problem of esophagoscopic removal, and demonstrate the foreign body in the esophagus. Films by Dr. Bertin.

way can be demonstrated by lateral film examination. The outline of the trachea can be shown and the presence of irregularity or stenosis revealed.

A patient, a young, adult man, was recently referred from the medical department of the University Hospital to our clinic because of extreme dyspnea. The roentgenologic examination by Dr. Pancoast showed almost complete obliteration of the tracheal shadow down to the level of the bifurcation. It also showed that the lumen of the right bronchus was clear. These findings we confirmed by bronchoscopy and found the obstruction due to a mediastinal tumor mass compressing the trachea.

During the past fortnight a child, four months of age, was referred to the clinic with an inspiratory stridor that had been present since birth. A lateral x ray of the

neck and upper chest showed marked displacement of the trachea anteriorly, with compression on the posterior surface, due to a retro-esophageal mass at the level of the suprasternal notch. In another child there had been signs of empyema on the right side. Thoracotomy was done for drainage of the supposed empyema and the pleura was found normal. A roentgenologist was then consulted who, upon examination of the chest, found a tack in the right lung. There was a large area of drowned lung beyond the tack. The removal of the tack cured the patient.

In another patient who had signs of tuberculosis in the right upper lobe, roentgen ray examination showed a pneumothorax in the involved side. In this case there were two clear contra-indications to bronchoscopy revealed by the roentgen ray, the presence of the tuberculous lesion and the pneumothorax. While neither of these find-

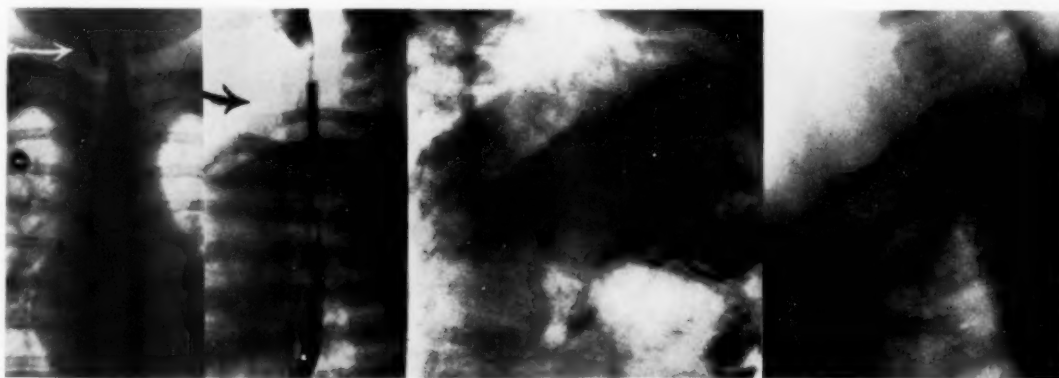


Fig. 10.—Perforating esophageal foreign body. (a) Metallic foreign body which has perforated the esophageal wall. The esophagus is outlined by the opaque substance showing the depth of penetration of the foreign body. (b) Lateral film shows the foreign body to be in line with the opaque mixture passing through the esophagus. The foreign body was removed esophagoscopically with double-planned fluoroscopic assistance. Films by Dr. John T. Farrell.

Fig. 11.—Gastric foreign bodies. Lateral film with opaque mixture showing a safety pin in the stomach. The opaque mixture, recently swallowed in contact with the pin, demonstrates the foreign body to be in the stomach.

Fig. 12.—Non-opaque foreign bodies in the esophagus. Capsule lodged in the cervical esophagus, where it remained until dissolved, held by a fish bone. The fish bone was removed from the position by esophagoscopy. Films by Dr. E. P. Pendergrass.

ings would be an absolute contra-indication to bronchoscopic examination, in this particular patient there was no indication that bronchoscopy would add anything to the diagnosis or treatment, so bronchoscopy was not done.

In another patient, a boy thirteen years of age, who had aspirated a cocklebur, there had developed marked signs and symptoms in the right chest. The child was running a septic temperature, and was extremely ill when admitted to the clinic. Roentgen ray showed a large pyopneumothorax in the right side and gave us a clear indication that external drainage of the pyopneumothorax should be carried out prior to bronchoscopy or removal of the foreign body. This was done by Dr. John B. Flick. The boy's general condition improved and his temperature soon came to normal; the foreign body was removed and the patient made a good recovery. Dr. David R. Bowen of the Pennsylvania Hospital, in his roentgenologic study of a case of pulmonary abscess, definitely localized a shadow which

he believed to be a portion of tooth, which roentgen ray examination of the patient prior to admission had failed to disclose. The bronchoscopic removal of the tooth cured the abscess.

In certain cases where the roentgenologist desires localization, pneumonography may be carried out by the insufflation of bismuth subcarbonate, as originally suggested by Dr. Jackson, or the instillation of lipiodol may be done to outline bronchiectatic cavities and localize pathologic areas with reference to the bronchi. In a young woman, twenty-four years of age, who had had adenocarcinoma of the lower lobe of the right lung, bismuth subcarbonate was insufflated and the roentgen ray showed definitely that the process extended upward to the middle lobe. From the knowledge of the extent of the lesion thus gained from the roentgenologist and the bronchoscopist, the surgeon decided that the case was too far advanced for operative removal and x ray therapy was carried out, under which the patient showed a remarkable improvement.

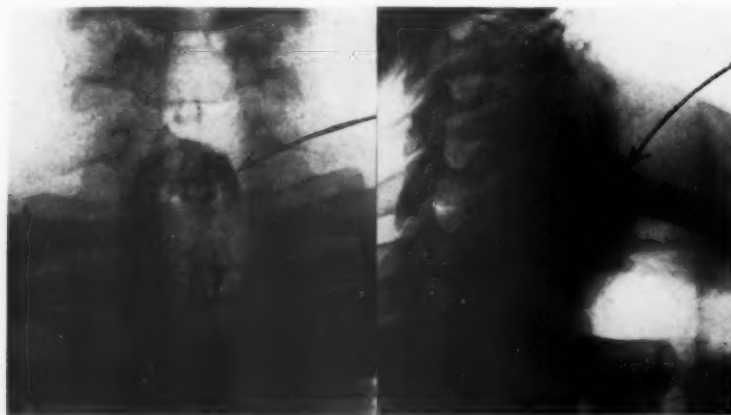


Fig. 13.—A peach stone in the cervical esophagus outlined by opaque mixture. The peach stone was not of sufficient density to be shown

without the opaque mixture. Films by Dr. Willis F. Manges.

At the end of a year and a half she is in very good health. /

#### FOREIGN BODIES IN THE AIR PASSAGES

In following the rule to include, in the roentgen ray examination, the anatomy from the nasopharynx to the tuberosities of the ischia for the exclusion of foreign bodies, the lateral exposure will be of most service in the nasopharynx. Pharynx, larynx and tracheobronchial tree films made in both anteroposterior and lateral position with observation of the patient while he is being rotated under the fluoroscopic screen are necessary for definite localization as to size, shape and position of the foreign body. [Pneumonography with bismuth subcarbonate or lipiodol will aid in

the localization with reference to the bronchi of both penetrating and aspirated. *foreign bodies.*

Double-plane fluoroscopic aid in the removal of opaque foreign bodies in those cases in which the foreign body has gotten in a bronchus so small that the bronchoscope will not enter is invaluable. It may also be of aid in the removal of a certain type of foreign body from the stomach, but it is only to be seen when the foreign body cannot be seen by direct vision through the endoscopic tube. The mortality in fluoroscopic-guided bronchoscopy is very much higher than in bronchoscopy guided by direct vision, and should always be carried out with fluoroscopic aid in two planes at right angles to each other. In nonopaque foreign bodies in the tracheobronchial tree

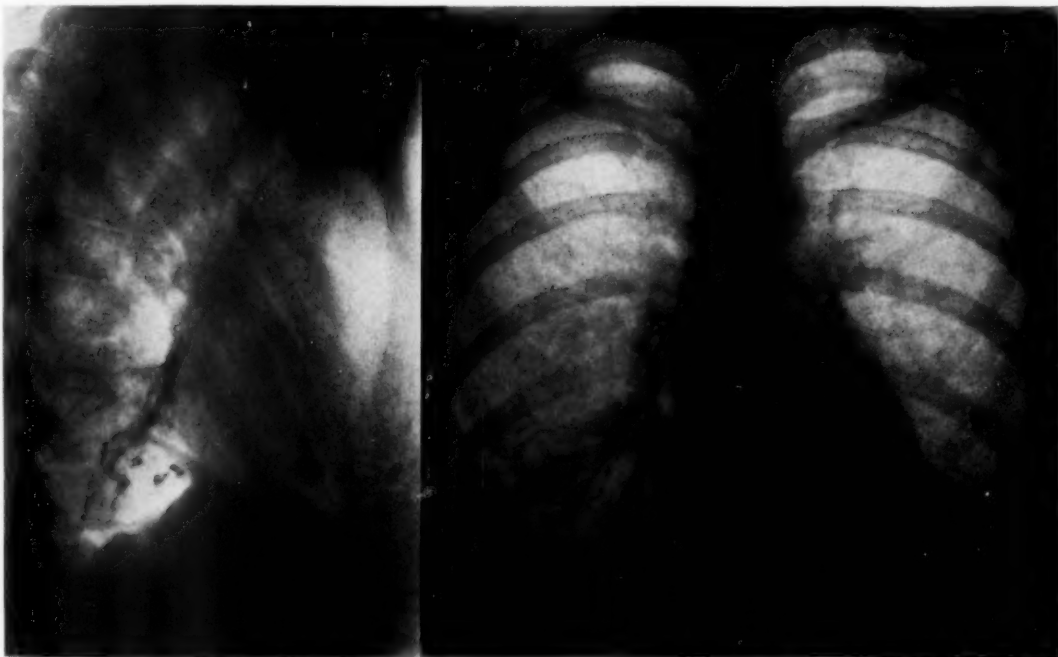


Fig. 14.—(A and B.) Pneumonogram. Bronchoscopic bismuth insufflation showing bronchiectasis involving the right bronchus and its branches.

Films, anterior, posterior and lateral, by Dr. Pancoast.



Dr. Manges has developed to a high degree of efficiency Iglauer's original discovery, in the recognition of obstructive emphysema and obstructive atelectasis as diagnostic signs. He states that it is absolutely necessary to expose the films at complete expiration and on full inspiration with apparatus that will permit the shortest possible exposure, in order to be of the greatest value in detecting these signs. The fluoroscopic examination will also show very definite changes in the normal respiratory movements and appearances that are characteristic. The foreign body does not cast a shadow. The area of obstructive emphysema or atelectasis is always distal to or beyond the location of the foreign body in the bronchus. Definite localization as to lobes, a single lobe, or a portion of a lobe of a lung is thus determined, and the foreign body localized in the bronchus that supplies the involved area of lung.

The nonopaque foreign body that occurs most frequently in the tracheobronchial

tree is the peanut. There was admitted recently to the clinic a baby girl eleven months of age who had choked with peanuts in her month. The physician consulted by the parents stated that x ray examination was of no value because the peanut would not show with the ray. The parents, against the physician's advice, brought the child to the clinic. The films by Dr. Manges showed marked obstructive emphysema of the right lung and a definitely localized nonopaque foreign body in the right main bronchus. We removed the peanut kernel from this location with the bronchoscope, and the child was sent home well three days later. This is one only of hundreds of cases where the roentgen ray localization has been just as accurate.

In another patient, a boy two years of age, referred to the Bronchoscopic Clinic of the University Hospital with a definite history of having choked with a bean in his mouth, Dr. Henry K. Pancoast reported a complete obstructive atelectasis of the entire

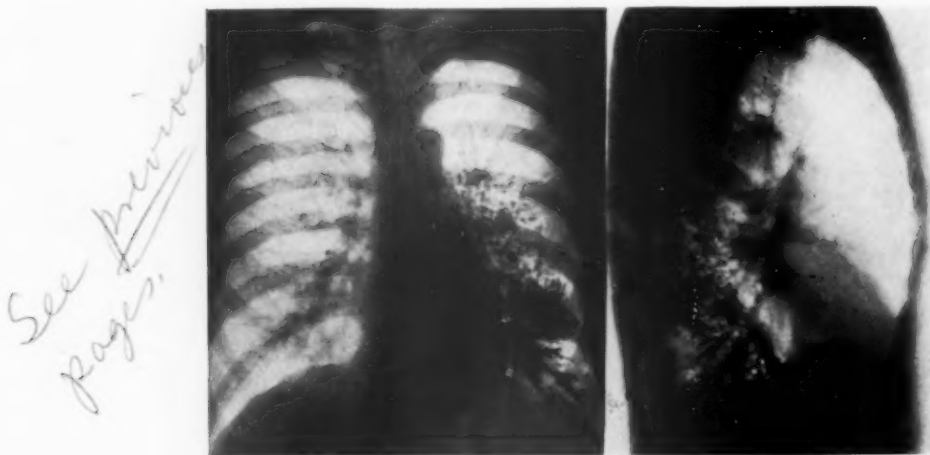


Fig. 15.—(a) Anteroposterior; (b) lateral. Pneumogram. Bronchoscopic lipiodol instillation demonstrating bronchiectatic cavities involv-

ing the terminal bronchi of the external division of the left lower lobe. Films, anteroposterior and lateral by Dr. Pendergrass.

left lung and stated definitely that the bean was localized in the right main bronchus. We removed the bean bronchoscopically from the right main bronchus, and at the end of twenty-four hours the right lung had returned to normal. One of the most remarkable cases, in that it showed both obstructive emphysema and obstructive atelectasis occurring at the same time in the same patient, was observed in a child who had aspirated a prune stone. This case was reported by Dr. Manges at the Pennsylvania State Medical Society Meeting in October, 1924. When the child was admitted examination showed an obstructive atelectasis of the right lower lobe, localizing the prune stone in the right lower lobe bronchus. At a second examination it was found that the right lower and middle lobes showed obstructive emphysema and the right upper lobe showed obstructive atelectasis, local-

izing the prune stone in the orifice of the right upper lobe bronchus in such a position as to cause complete obstruction to the lower and middle lobes only on expiration. The prune stone was removed bronchoscopically from this position and both the obstructive atelectasis and obstructive emphysema rapidly cleared up.

Recently a call was received from a hospital at which we do not have a clinic, from a physician who had under local anesthesia done a submucous resection and removed one tonsil and was removing the second tonsil when a sponge which he had placed in the tonsillar fossa from which the tonsil had been removed became dislodged and was aspirated. Physical examination showed that air did not enter or leave the left lung. The patient was kept in the operating room. We went immediately to the hospital with

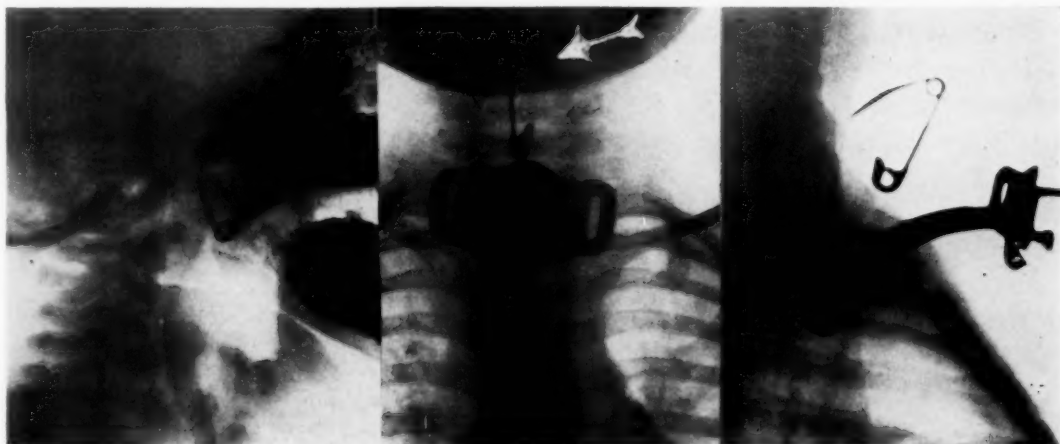


Fig. 16.—Foreign body in the nasopharynx, as demonstrated by lateral film.

Fig. 17.—Foreign body in the larynx (a) Anteroposterior; (b) lateral. The foreign body is seen in the cervical region, its greatest width in the sagittal plane. This demonstrates it to be in the larynx.

Patient had been tracheotomized for sup-

posed diphtheria eight months before admission. On admission Dr. Manges stated that the pin was in the larynx and had remained there for some time because of the corrosion of its pointed branch. After endoscopic removal of the pin the child was decannulated. The patient had never had diphtheria, and a roentgen ray examination prior to admission, had missed the safety pin in the larynx.

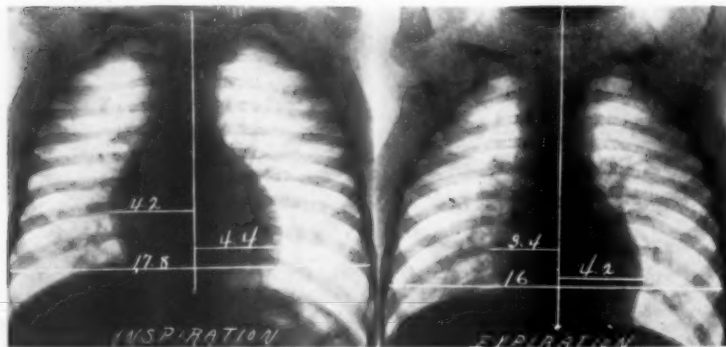


Fig. 18.—Non-opaque foreign body in the trachea. (a) inspiration; (b) expiration.

a bronchoscopic outfit. Dr. Sender, the roentgenologist, made films on inspiration and expiration and definitely localized the foreign body as completely obstructing the left main bronchus. Under local anesthesia we removed the tonsil sponge, together with the blood clot, from the left main bronchus.

The mechanism of obstructive emphysema, as described by Dr. Jackson, is dependent upon three types of bronchial obstruction: 1, bypass valve obstruction; 2, check-valve obstruction, and 3, stop-valve obstruction. The bypass valve obstruction permits both ingress and egress

of air. The check-valve obstruction allows air to pass in but not to emerge, producing obstructive emphysema, and the stop-valve obstruction is the type in which air cannot get either in or out, resulting in the absorption of the residual air and obstructive atelectasis. These types of obstruction may be produced by aspirated, foreign bodies, by autogenous foreign bodies, as in massive pulmonary collapse, and also by bronchial compression.

In certain cases after the removal of the foreign body the obstructive emphysema still remains and the question arises whether

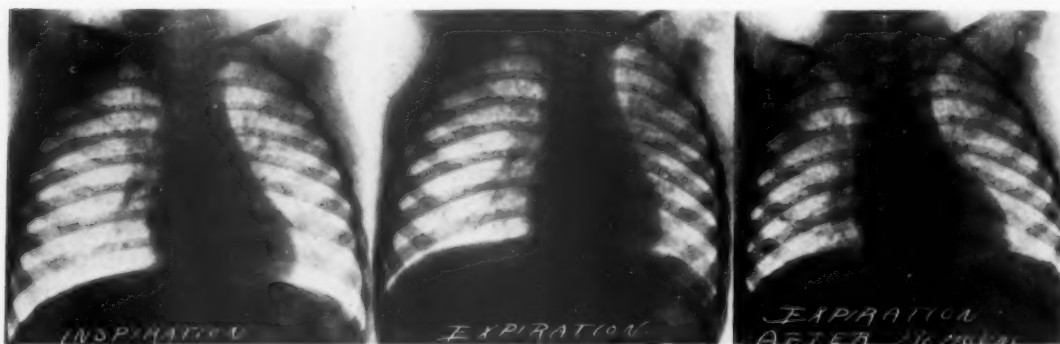


Fig. 19.—Non-opaque foreign body in the right bronchus. (a, b, c) Films at inspiration (a), and expiration (b), demonstrating the presence of obstructive emphysema of the right lung, localizing the foreign body in the right main

bronchus. Compare film (c), expiration after removal. Heart remains in normal position, right diaphragm normal. Films by Dr. Willis F. Manges.

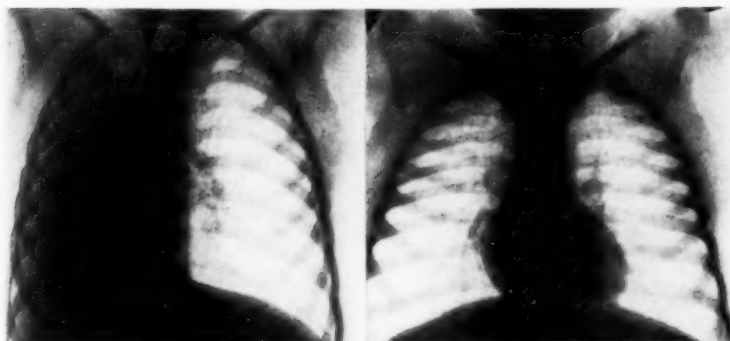


Fig. 20.—(a and b.) Foreign body in the right main bronchus. (a) Film showing atelectasis of the right lung with displacement of the mediastinal structures toward the affected side, localizing the foreign body in the right main

bronchus. (b) Film 24 hours after bronchoscopic removal of the bean, showing the return of the mediastinal structures to normal position with normal function of the right lung. Films by Dr. Pancoast.

another portion of the foreign body is still present. With these cases repeated observations over a period of at least a week are necessary. The thick, tenacious secretion, with the local inflammatory reaction that is present in these cases, may still give rise to obstructive emphysema and if at the end of one week they still persist a diagnostic bronchoscopy is done. In obstructive atelectasis if the sojourn of foreign body has been of sufficient duration to cause drowned

lung to occur, some evidence of atelectasis will still remain, but should clear up progressively. In some instances it may require bronchoscopic aspiration.

All roentgenologists are familiar with the diagnostic signs of postoperative massive collapse of the lung, namely: the evidence of atelectasis with displacement of the heart and mediastinum toward the affected side. We have had opportunity to

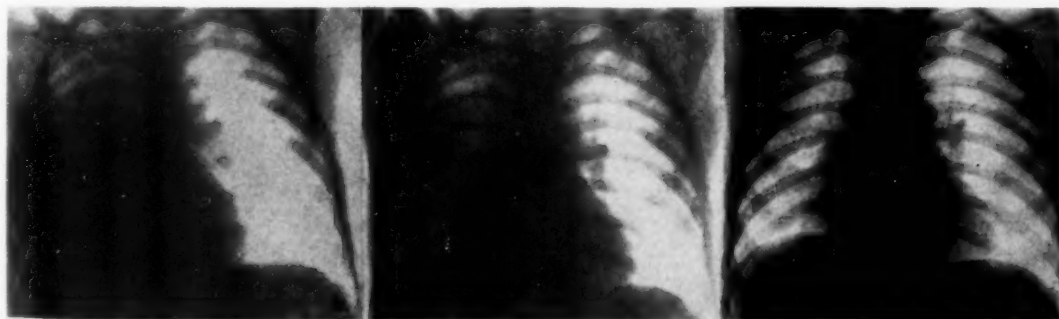


Fig. 21.—(a, b, c) Postoperative massive collapse of the lung. (a) Film showing atelectasis of the right, middle and lower lobes with the mediastinal structures displaced toward the affected side. Compare this film with Fig. 18, and contrast it with Fig. 20, pneumothorax. (b) Ten minutes after bronchoscopic removal of secretion from the right lung, showing air

in the lower and middle lobes, mediastinal structures have partially returned to normal position. (c) Films showing both lungs clear, 72 hours after bronchoscopy. Bronchoscopic examination at this time showed the right bronchus and its branches to be open and the right lung functioning normally.

study bronchoscopically two cases of post-operative massive collapse of the lung and, with the aid of the roentgenologists, have been able to demonstrate that the removal of the autogenous foreign body, the thick, tenacious mucous from the bronchi, allows return of function of the lung, and that the removal of this obstructing secretion is necessary before expansion of the lung can occur. In one case Dr. Manges demonstrated for us by making films on full inspiration and complete expiration immediately after bronchoscopy that air entered and passed out of the portion of lung that had shown collapse previous to the bronchoscopic removal of the obstructing secretion.

#### DISCUSSION

DR. ROY W. FOUTS (Omaha, Nebr.): I think the College is to be congratulated, and we are very much indebted to Dr. Tucker for presenting this very remarkable presentation on bronchoscopy, with reference to foreign bodies in the lung. From the standpoint of the radiologist, I think it is one of the best things that I have ever seen or heard, and it is extremely in-

teresting. I don't feel that I am competent to discuss it further than to say that we run across just such conditions as these every now and then, and they are sometimes quite distressing.

There is one point I would want to stress, and that is that nothing but the best x ray films would suffice in the way of making the diagnosis. The fluoroscope is not sufficient. It is undoubtedly a valuable aid in removing the foreign bodies, but from the standpoint of the diagnosis it cannot be relied upon altogether.

Bear in mind that there are three or possibly four places that foreign bodies are apt to lodge in the gastrointestinal tract once they pass beyond the pharynx. The doctor mentioned the point where the aortic arch crosses the esophagus. The next place is the stomach, then the pylorus and the ileocecal valve.

Some time ago a baby about a year and a half old was referred to me for examination. It was attacked with a sudden onset of spasmodic cough with some difficulty in breathing. Between these intermittent paroxysms of coughing, which occurred three or four times a day, the child would rest undisturbed.

There was a provisional diagnosis of whooping cough. We could not make out a foreign

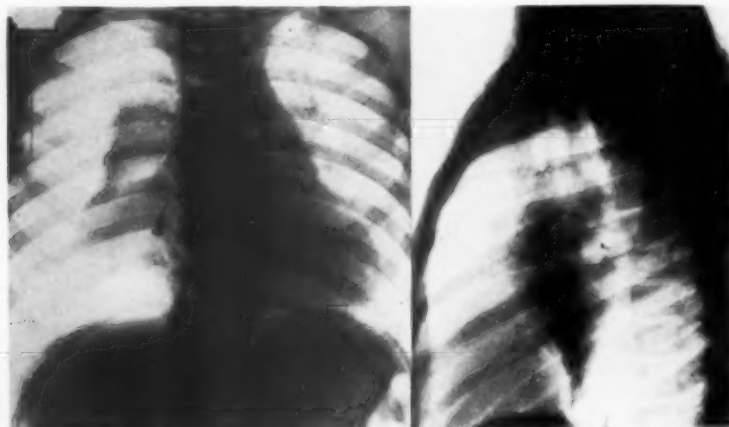


Fig. 22.—(a) Anteroposterior (b) lateral. Right-sided Pneumothorax. Pneumothorax due to perforation into the pleura from a tack in right

bronchus. Compare with films of obstructive emphysema, obstructive atelectasis, and post-operative "massive collapse."



body in the bronchi on x ray examination, but the patient was referred for bronchoscopy. A grain of corn was located. It is a thing to be borne in mind. It will be unusual if any man goes through a number of years in practice and does not see a case of the character that has been mentioned to us.

I think the value of this presentation is unlimited, and we will only profit by what we have heard by practicing it. We are greatly indebted to Dr. Tucker for coming out here and being with us.

QUESTION: I should like to ask the essayist how he accounts for those safety pins so frequently passed successfully through the alimentary tract.

DR. GABRIEL TUCKER: We depend upon the roentgenologist to tell us that. Dr. Magnus told us a certain safety pin wouldn't pass, and we learned after while to take his advice, and in one case in particular there was a very large closed safety pin that entered with perfect safety into the stomach. He said it wouldn't pass. We thought maybe it would. We let it stay there for about two months, and we had to take it out. He was right. The roentgenologist is the man to tell us when it will pass and when it won't pass.

QUESTION: Why does an open safety pin, point down, turn around in the alimentary tract so that it is delivered with the side out that you want to come?

A few years ago my attention was attracted to an article by Schmidt. He said that you will find when a safety pin gets into the alimentary tract open, with the point in the course in which the pin has been naturally delivered, you would expect that pin to get stuck. He says almost invariably it will not get stuck, and when it was explained it was very ingenious. When a pin sticks in the intestines, the peristalsis continues and as a result the pin turns around and finally goes on. Although I cannot vouch for the correctness of his contention, I think it is sufficiently interesting to bear it in mind.

DR. TUCKER: It has been our experience that pins turn in the stomach, that they don't pass out of the stomach point first. When they go through the pylorus they go spring first, but there is that mechanism of the mucosa contracting from the point, the peristalsis will carry the pin along and the point of the pin doesn't perforate that portion of the bowel, will get away from it, and it will be carried along.

Ordinarily the safety pins that we have followed we have found to pass through the pylorus spring first. The turning takes place in the stomach.

## THE RADICULAR SYNDROME\*

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THE frequency of the radicular syndrome and the fact that so few cases of the disease or disorder are correctly diagnosed authorizes a careful consideration of this condition. It is astounding how little space is given in the text books to the consideration of this syndrome and how little or no attention is paid to the therapeutics of the disease. It has been the writer's experience that where the condition is amenable to treatment, proper diagnosis and proper treatment have obtained most satisfactory results, by a combination of various measures hereinafter to be considered.

In conversation and consultation with many physicians, I have been surprised how few even knew of the existence of this syndrome or had even suspected such a condition likely to be present in a given case. I did not consider this very surprising when we find several recent and excellent "Systems of Medicine" not even making reference to the disease, nor does it appear in the indices of many treatises on neurology, general medicine, diagnosis, etc. This lack of attention to a condition capable of causing such pain and suffering is to be regretted and the writer believes that it really deserves full, careful and thoughtful attention and treatment. While internal medicine and

neurology, especially neurology, are difficult and exacting specialties, still the general practitioner of medicine should know of the existence of this disease and be aware of the possibility of its presence in any suspicious case. One should not be content to dismiss the patient with the threadbare diagnosis of "neuritis," for this designation like hysteria and neurasthenia of old is at present camouflaging many states of regional and localized pain.

To me the subject is not only of infinite interest but a very practical one considered from the standpoint of the patient. Its pathological states may vary from simple, mild pressure and inflammatory states and reaction to neoplastic growths. It may be an expression of a purely local and limited process of benign character, or a reaction to a general severe disease of the central nervous system. It is not unusual to learn from the history of the case that the patient has had various manipulative treatments given, as a result of which the inflammation, pressure, trauma or existing condition has been increased as well as the suffering and disability. It should be remembered that the spinal nerve roots can be subjected to an astonishing amount of abuse without seriously crippling their function, especially if the pathological causative factor

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is slow in its development. Further, remember that radicular areas are very different from the areas of peripheral nerve distribution.

#### DEFINITION

I have chosen, since I commenced the preparation of this communication, the term *Radicular Syndrome* in preference to *Radiculitis*. The latter is in reality a misnomer for the signs and symptoms of the radicular syndrome may be present as a clinical entity without any inflammation necessarily being present. We may, therefore, define the radicular syndrome as a clinical entity resulting from any interference with that portion of the spinal nerve roots between their emergence from the cornua of the spinal marrow and their emergence from the intervertebral foramina. As a true radicular syndrome its anatomical basis should be from the emergence of the spinal roots until they pierce the dura mater. In other words, the true limited radicular syndrome is an intraspinal or intramembraneous involvement, which may affect either the anterior or motor root or the posterior sensory root and its ganglia or both. Most authors, however, agree that it is best to consider the radicular syndrome in a broader sense and thus extend the meaning of the term to embrace the intervertebral portion as well. In truth, many cases of so-called radiculitis and their accompanying symptoms are the result of pressure and not inflammation.

#### ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS

In order to understand this disease one must have available certain anatomical and physiological data. The vertebral column is the central axis of the skeleton. It is surmounted by the skull, supported by the hip bones; to it laterally the ribs and upper extremities are attached and its weight is finally transmitted to the lower limbs. It is composed of 32 superimposed bones and averages 28 inches in length. It is divided into four regions and has four curves when viewed laterally. In the female the lower curve (normal lordosis) is accentuated. Viewed antero-posteriorly it presents four pyramids:

1. From axis to first dorsal with its apex upward.
2. From first to fourth dorsal with its apex downward.
3. From fourth dorsal to fifth lumbar with its apex upward, and,
4. From the fifth lumbar to the coccygeal termination with its apex downward. It possesses 23 intervertebral substances or discs—tough, compressible, elastic, a composite structure, with a central pulpy substance and circumferential lamina of fibrous and fibrocartilage strands criss-crossed ordinarily from vertebra to vertebra. The central pulpy portion forms a ball, very elastic, expansile and constitutes a pivot around which the vertebra can twist, incline or tilt as on a ball joint. They vary in size

in different anatomical regions. The spinous processes also vary in different regions. On each side of the vertebra is the intervertebral groove which when united with its fellow vertebra forms the intervertebral foramina, being formed in the cervical and lumbar regions by the laminae and articular processes, and in the dorsal regions by the laminae and transverse processes. In the lateral view the foraminae appear oval in shape. The bones are bound together by ligaments—*intra* and *interspinal*. Its arterial, venous and neural supplies come from the regionally related vascular and nerve distributions. Within the spinal canal lies the spinal fluid. From the cornuae of the cord the nerve roots originate anteriorly and posteriorly, respectively. These pass laterally from the cornuae, join to form the mixed peripheral nerve and pass out of each of the 23 intervertebral foraminae. The root from the anterior horn carries motor fibres, that from the posterior, sensory fibres. The sensory root passes into or forms a ganglion before it joins the motor root. The fasciculi of each root perforate the pia mater and arachnoid and receive sheaths from both the pia and arachnoid. Each root pierces the dura mater close to its fellow and receives a separate sheath from this membrane. Just beyond the ganglion they blend into a nerve trunk. By means of these sheaths from the dura mater the nerve roots are attached to the periostium at the margins of the intervertebral foraminae, and give lateral support to the cord itself. After leaving the foraminae these nerves by division and anastomosis

form with other nerves—the gross anatomical plexuses from which the peripheral nerves pass to their various distributions. The intervertebral portions are protected by a fatty cellular tissue in which lie the lateral spinal arteries, a venous plexus and lymphatics. The nerves receive in the foraminae branches from the sympathetic nervous system (*rami communicantes*).

The roots lie within the bony canal and dura mater in contact with and bathed by the cerebro-spinal fluid. The intravertebral portion, while covered with a prolongation of the dura and surrounded by various soft structures of the intervertebral canal (arteries, veins, adipose-cellular tissue) are not bathed by the spinal fluid. Gordon, quoting from the work of Dejerine and Sicard, calls attention to the three segments that should be studied as separate entities, functionally and pathologically. The first segment consists of the intraspinal section, the pathology of which constitutes a true *radiculitis*. The second or intervertebral portion, the pathology of which constitutes a *funiculitis* (Sicard) and the third or plexus portion a *plexitis*. Dejerine, however, classified the first two under the term *radiculitis*. Each one possesses certain relationships to causal factors and produces more or less definite clinical symptoms. It will be readily seen that the mechanical construction of the vertebral foraminae, and the protective coverings of the neural structures serve the purpose of protection, not only from injuries directly applied to any portion of the spinal system

but from sudden twists and strains of the column itself.

#### ETIOLOGY

The three divisions, heretofore mentioned, bear a very close relationship to certain causative factors. Any influence that tends by pressure, strangulation, inflammation or compression within the intraspinal segment produces a true radiculitis or syndrome within the strict meaning of the term.

The predominating cause within this first segment is syphilis, and it may here be stated that syphilis practically never affects the peripheral nerves. Specific meningitis must always be kept in mind especially when radicular symptoms are produced and the meningeal symptoms are latent. That this condition is well known goes without saying. It may and often does develop and run its course without giving rise to any definite, distinctive or characteristic symptoms until the exudate which collects in the meningeal sheath produces some pressure on the nerve roots as they pass out toward the intervertebral foraminae.

By what particular mechanism a diffuse meningeal process may lead to a predominating posterior radicular lesion is interesting. In the first place it has been shown that meningeal processes are more frequent on the posterior aspect of the spinal cord. Inflammatory involvement of the pia mater may affect the nerve roots at their entrance into the cord itself. There does not seem to be any question but what the existence of

these forms of inflammation with their consequent pressure and strangulation have been linked to a meningeal process.

Tuberculosis may be a factor in the first or root segment, but is in my opinion more frequently found in the second or intervertebral portion. The condition in tuberculosis again is compressive but this secondary compression or strangulation is the result of the mechanical weakening of the vertebral bony structures of the spine itself.

Trauma is one of the unquestioned factors in the production of these troubles. My experience has taught me that trauma is more apt to produce the condition when applied with considerable force directly to and within a limited space. Sometimes we wonder how a very moderate degree of trauma may set up a severe radicular trouble. It must be borne in mind that perhaps the explanation of this condition is to be found in the fact that the former has started anew some old condition that has long laid dormant, such for example as some of the ordinary or hypertrophic arthritic states of the spine.

Focal infections and toxemias do not as a rule produce the radicular syndrome through their direct action upon the neural structures themselves, but tend to cause the disease by bringing about inflammatory constrictive or pressure conditions by producing pathology in the bony structures or soft tissues through which these nerve structures pass.



We may mention inflammation produced by exposure, arthritic states (so-called rheumatic process) gout, or any form of spondylitis. Sometimes an infective or toxic process has so weakened and prepared the structures that it does not require but a moderate degree of blow, twist, jar, etc., to establish the active factors of the underlying process.

Occasionally we find that underlying the condition and making it more difficult of treatment is a general condition of disturbance of one or more of the endocrine glands and that the proper administration of such glandular extracts aids in the recovery.

One cannot be too careful in their search for etiological factors. Among those that are at times present but usually overlooked is calcification of the ligamentous structures especially of the lower back, ranging from a single slight to an extensive calcification on one or both sides. It seems to the writer that a study of the causative factors of a condition such as the radicular syndrome and an appreciation of the underlying pathological possibilities should teach a clear lesson that the spine, its cord, roots and nerves is not an entity, separate and distinct from the human body nor yet capable of forming the basis for a school of medical philosophy or therapeutics. The human body including the spine is most wonderfully constructed and of all the mechanisms of this mundane sphere the most delicate and the most intricate.

#### SYMPTOMS

*Pain:* The predominant symptoms of this syndrome are to be found in the sensory sphere of the nervous system and of the sensory manifestations the principal one is that of *pain*. The distribution of this pain may be local or may follow the regional distribution of the nerve roots, the physician remembering that regional radicular pain is quite different from regional peripheral nerve pain. The character of the pain varies greatly. It may be sharp, sudden, knife-like, boring or lancinating, or it may be dull, heavy, sore-like, or aching. *It is increased by sneezing and coughing* and when quiescent an attack of pain may be brought on by either of these means. The pains are usually severe, although variable. They frequently come in crises, often resembling the pains of tabes and after their subsidence either temporary or permanently the affected area often remains tender and sensitive. This is especially true between attacks. A case presenting general bone aches or pains in the back plus local tenderness may be the starting point of a radicular syndrome. Again we state that these pains are not segmentary in character (that is, involving hand, forearm or arm) nor do they follow peripheral nerve distribution, but are usually distributed in long bands in the particular portion of the body involved and corresponding to the root segments involved. Positional movement tends to increase the condition and bring on an attack of pain. Such movements as bending, extension, pressure, a sudden

jar or twist, by momentarily disturbing the balance of the trunk, modify the size and shape of the foraminae and thereby irritate the nerve structures. Pain may often be produced from pressure during an examination. The pain at times is diffuse, yet a very small area may cause severe and agonizing pain as first mentioned by Bechterew. A diagnostic point in relation to the pain of this disorder was first noted by Dejerine, who described the pain, shooting into the pelvis, abdomen or limbs according to the roots affected when the patient strains as in coughing and sneezing.

*Hyperesthesia:* Sensitiveness is nearly always present and may be epicritic (superficial) or protopathic (deep). It may be localized or diffuse and it has been the writer's observation that the areas involved are nearly always sensitive to a lowered barometer and to cold, moist weather and winds.

*Paresthesia:* These sensory manifestations occur with considerable frequency. Almost any form of sensory disturbance may be present, and may vary from day to day. The most common are tingling, coldness, heat or burning, deadness or numbness, alternation of heat and cold and formication (crawling). The paresthesiae may last for some time and later be followed by anesthesia, a sign of an increasing involvement of the roots.

*Anesthesia:* Anesthesia may or may not be present. When it first becomes noticeable it may be variable from day to day both in distribution and intensity. Such variations represent, in my opinion,

differences in the degree of pressure and this variation in pressure probably has an underlying vascular pathology. Vasomotor disturbances locally as well as distally result from root irritation and it seems it would be the most reasonable explanation. This is frequently observed in the earlier stages or milder involvements that have syphilis as a provocative agent. In such an exudate the vascular changes are most variable. It is less irregular and variable in tuberculous states and neoplastic growths. Here notable changes in sensory loss may render a differential diagnosis difficult, in fact, may simulate by a pain and temperature loss with the retention of tactile and muscular or positional sense, a syringomyelia. Again the sensory loss may be such as to point to a commencing tabes or there may be variations of loss that fit into no particular or suspected spinal lesion, but usually a careful study of the case will enable the neurologist by elimination to reach a correct diagnosis. In these cases a careful study of the sensory disorder will prove of much value, and often enlighten where a failure to test may doubt and cloud the question. Sensory studies are so rarely made by the general practitioner that anesthesia is frequently overlooked. Plainly marked objective anesthesia, of long duration, is not a good sign. It indicates pressure or degenerative changes of severe degree and sometimes destruction of nerve tissue. The sensory findings must, of course, be correlated with the other symptoms present. A rare but interesting form is the *Anesthesia Dolorosa*, a state of painfulness in

an area anesthetic to test. Plainly marked anesthesia should lead one to suspect destruction of nerve roots.

*Motor Disturbances:* If the intrathecal roots were solely involved one might find a pure type of radicular involvement of motion or sensation, much more frequently of the posterior than the anterior. This is rare and the extension of the trouble to the intravertebral (funicular) portion may superadd symptoms within the motor sphere. If we would have all the fibres that go to make up a mixed nerve involved in the process, it would be difficult to separate the radicular syndrome from a true peripheral neuritis. In a physical examination of a case of this kind we may expect to find nearly always a local *rigidity*, varying in degree from a barely detectible difference between the muscular tonus at the level of the lesion and that of the spinal muscle above and below, to a rigidity so marked as to be board-like in its hardness. Motor weakness may vary from flabbiness and flaccidity to distinct loss. In a recent case involving the lower spinal nerve roots a true hypotonia of the left knee joint was present with slight muscular atrophy in the root distribution of the thigh. Ataxias may be present.

In the radiculitis of lues motor changes are not infrequent and in tuberculous disease it may for some time be the only sign of the disease. Such symptoms cry out imperatively for prompt attention and relief to prevent degeneration and to hasten regeneration of the nerve root fibres.

*Reflex Alterations:* The reflexes may give some very useful indication of the involvement of the nerve roots. These important tests are too often made in a careless manner. Much better measure of their response may be retained by placing one hand lightly on the contracting group of muscles and noting the intensity of the muscular contraction. I have found that the plan of trying to produce response by the least possible excitation is the best, and where one side only is involved and the other is available for comparison, slight differences are in this way more easily detected. In this syndrome the reflexes are at first increased or exaggerated, and greater on the involved than the uninvolved side. If nerve degeneration takes place they are diminished or lost in proportion to the involvement. It must be remembered that for differentiation between the radicular syndrome and peripheral neuritis, the reflexes furnish little help, as they are impaired in both diseases, but give useful knowledge when grouped with other symptoms.

*Trophic and Vasomotor Disturbances:* My experience has been that trophic lesions are not common. Their presence indicates a severe lesion, usually accompanied by anesthesia. Shiny skin in the extremities, especially in a finger, or fingers, rough dry skin and the appearance of the skin, similar to that of the hands of the laundress, after several hours in water have been observed. The presence of ulcers or any solution of continuity of the skin, is usually due to some

localized trauma, acting upon the anesthetic or trophically involved skin. Vasomotor symptoms are more frequent. Constriction of the vessels with coldness to touch, and localized sweating are not uncommon.

*Regional Symptoms:* A very brief reference to groups of symptoms that occur because of the region involved may not be amiss.

1. In the *upper cervical* region we have, of course, the pain that is often termed Neuralgia. Here we should search for muscular involvement, a mild, *torticollis* involving the vertebral and sternomastoid muscles. Usually pressure upon the nerve exits will produce muscular spasm and *very severe pain*.

2. In the *lower cervical* region the pain follows the segmental distribution via the brachial plexus, along the inner side of arm, forearm and hand. Pressure upon the nerve exits produces muscular spasm and pain. Marked sensory involvement is common and the symptoms, common to the condition, may be accompanied by acute sympathetic symptoms such as enophthalmia, narrowing of the palpebral fissure and pupillary symptoms (myosis).

3. In the *dorsal* region it follows the intercostal distribution. The pain varies from mild to very severe. It may produce a "lopsided" position, with opposite shoulder lowered and the shoulder of the affected side raised. Pressure on the spinal exits tends to produce spasm and pain. It is claimed that a very tenacious

form is due to hypertrophy of the epidural fat.

4. In the *lumbo-sacral* region, a common location, sciatic manifestations are common. We may find a so-called "lumbago" without osseous or ligamental lesions, moderate kyphosis, regional pain and contracture of the lumbar muscles. Pressure in this region does not seem to produce the tendency to spasm or pain in the same degree as other regions, possibly due to the heaviness of the vertebrae, the deep-seated exits of the roots and the superimposed tissues. There is, however, no certainty that pressure will not produce its usual result.

#### DIAGNOSIS

The first and basic factor is a detailed and careful anamnesis. History taking is an art, and not enough cultivated by the younger generation. It takes care, patience and much time. This should be followed by a thorough *general*, physical examination for the purpose of gaining a general view of the *status quo* of the patient. Next a complete *neurological* investigation, especially the motor and sensory tests, and electrical reactions of nerve and muscles in the area affected is indicated. The methods of Head and Dejerine should be employed. The laboratory technicians must report radiologically upon the spine, the heart, aorta, lungs, gastro-intestinal tract, teeth and sinuses. The blood serum, gastric juice, bile, feces, urine, metabolism *et al* constitute the modern needs of such an examination. Where the lower limbs are



involved there may be some ataxia, loss of knee jerks that may be mistaken for tabes, although tabes may start as a specific radiculitis. Much of the radiculitis involving the lower spinal segments is due to syphilis and in these cases much light is thrown on the case by the pupillary changes. At times the x ray and all methods of careful study and investigation fail to give a definite pathological picture and one must intuitively venture a diagnosis, assuming perhaps that in these cases, the exudates about the nerve roots, while responsible for the symptoms, do not irritate or compress sufficiently to produce a definite diagnostic syndrome. Here often is a golden opportunity for therapy. The frequency with which spinal syphilis first makes its appearance through this syndrome is not appreciated by the general profession. It is in these cases that "readjustments" may result very disastrously to say nothing of the loss of very valuable, nay precious time.

*Radiculitis:* In radiculitis we have the inflammation intrameningeal. Additional diagnostic data can be obtained from the spinal fluid. (Wassermann positive, lymphocytosis, increased albumen, due to inflammation of the meningeal coverings, increased globulin). Position and movements of trunk causes but little increase of symptoms. Muscular spasm is not often present. Attitude is normal. Reflexes are usually increased. Eye and pupillary symptoms are present in relation to regional and causative factors. It is here that a careful investigation of

sensory changes well repays the time and trouble, as it will show the radicular distribution of the pain, hyperesthesia and anesthesia, etc., if present. The crural nerve area is more often involved radicularly. Sciatica, so-called, is more often periperal.

*Funiculitis:* In funiculitis the pain is more intense locally than in the root distribution. It is markedly increased by local pressure in the area involved and in a space one and a half to two inches measured from the spinal process. Pressure on the spinal process does not as a rule cause pain. There is marked hyperesthesia over the radicular spinal segment. Later we may have sensory loss of both epicritic and protopathic sensibility. Muscular spasm localized in the lateral muscular spinal groups is almost always present. The increased tonicity or rigidity is easily felt. It is usually unilateral. These are the cases that assume the attitude before mentioned, that is to say, inclined to the opposite side. They tend to "fix" the shoulders, trunk or lower back in order to avoid any jar or muscular strain as these produce pressure on the tender and irritated funiculus.

The trunk is inclined to the opposite side (the antalgic attitude of Sicard) to produce a separation or lifting of the articular surfaces by position, thus lessening the compression, relieving strain and relaxing the two articulating surfaces. There are generally the usual referred sensory symptoms, subjective and objective, in the regional distribution.



The reflexes usually are increased in the early and diminished or abolished in the later stages. Skin eruptions of an herpetic character are frequently present and eliminate the question of neuritis. The spinal fluid may or may not show the presence of specific disease by a positive reaction with lymphocytosis and albumen increased.

*Neuritis:* This is a peripheral disease involving the plexuses or single nerves. It may range from an irritation from infection or toxin to complete degeneration. Its pathology is usually toxic or infective when it is not traumatic (direct injury, pressure, etc.) or due to chemicals (alcohol, lead, arsenic, etc.) There is pain; deep tenderness especially along nerve trunks; pain on extension of the structures supplied by the nerve, especially those of the limbs (Lasegue's sign). Impaired conductivity; motor weakness or paralysis; atrophy from mild to severe; trophic symptoms well marked, appearing early, and the electrical reaction of degeneration. At times the nerve trunks can be felt to be thickened. The spinal fluid is negative.

#### DIFFERENTIAL DIAGNOSIS

This syndrome must be differentiated from a number of other diseases and disorders.

1. *Spinal Tuberculosis* or Potts Disease is more likely to manifest itself early in the motor sphere. There is deformity, the reflexes are impaired and a radiogram usually settles the question.

2. *Osteitis*, osteo-arthritis, arthritis deformans, vertebral arthritis (the so-called "vertebral rheumatism" must be differentiated by means of the x ray:

3. *Neoplasms* (tumors, cancers, etc.) present in early stages a difficult problem. Pain that is unilateral, later becoming bilateral, is considered practically pathognomonic of tumor.

4. *Intrathoracic growths*, especially aneurysms, are differentiated by radiographic screen and film, together with certain intrinsic symptoms relative to the organs involved and the cardiac and circulatory apparatus.

5. *Trauma* carries with it the history of injury, local changes and needs careful neurological study and radiographic filming.

6. *Renal Calculi* and *Ligamentous Calcification* are discoverable by the x ray and by the x ray only, unless in the first instance the urine may add its quota.

7. *Tabes* has been more or less considered, but we mention again the study of the pupils, reflexes and sensation.

8. *Disseminated Sclerosis* may have root pains, and few will mistake poliomyelitis save in the early stage.

9. *Myelitis* with its marked paralysis, sphincter involvement, etc., presents no difficulty.

10. *Herpes Zoster* is practically always unilateral. It must not be forgotten that its pains may last for

months and even years after the attack and external manifestations.

It must be borne in mind that radicular pain is always in the same location, is sharp and projected. It may show itself in the deep structures affecting organs such as the stomach, intestine and pelvis. I have lately seen a case of the radicular syndrome so severe as to stimulate an acute appendix and right ovarian inflammation. It was of specific origin, and yielded to proper chemical and physical treatment.

11. *Neurasthenic* trunk pain may stimulate this syndrome with its deep, boring ache and tenderness. It occurs usually below the inferior angle of one or both scapula, but is more diffuse and less superficial than the syndrome. In this connection and frequently associated with functional, nutritional, psychic or psychoneurotic conditions is pyloric spasm with its accompanying hyperchylia or hyperchlorhydria. Irritation of the sensory nerve endings of the gastric end of the oesophagus (cardio-spasm) producing a spasm of its muscular walls may cause a burning pain usually referred to the seventh left chondrosternal junction and is accompanied by aches, soreness and tenderness referred to the left interscapular region.

12. *Myositis* of the lumbar muscles as well as sacro-iliac sprain should present no difficulties.

#### PROGNOSIS

Prognosis depends upon the condition present, the stage at which the case is

seen, the general condition of the patient and any complications that may be present. Another factor of no small import is the question as to whether one must depend solely upon hygiene, rest and chemical measures alone. Under these handicaps the prognosis is doubtful or grave. The prognosis is much better where physical therapy is used in addition to the usual treatment. In my experience many brilliant results have been attained in cases, even of long duration.

#### TREATMENT

*Acute Stage.* In all cases of this disorder it is essential to try and seek the cause of the condition and if possible remove it. This is academic and is easier to state than to perform. The correction of general bodily states and the opening of all of the emunctories favoring elimination is to be immediately instituted. Hydrologic applications are here very efficient. The fomentations applied to the entire spine followed by a stimulating compress for an hour are remedies that will give much relief and comfort. The high-powered incandescent light, white or blue, applied to the spine and back as well as to the anterior body and followed by graduated sponge baths will relieve pain, lessen spasm and favor elimination. Where possible a superheated dry hot air body apparatus may be used, allowing the patient to remain from thirty to sixty minutes at a high temperature. In all these measures cooling applications should be made to the head during their use to prevent retrostasis. Of recent years diathermy

and high frequency methods such as autocondensation and the silver vacuum electrode all administered to the patient in bed have proven very satisfactory. In the acute state rest is a *sine qua non*. The medical treatment should be such as to meet the indications and if possible to remove any underlying condition reached by chemical means.

*Chronic Stage.* As soon as the patient has passed into the chronic stage more active measures may be employed. Where one has detected any causal state this should be constantly watched and treated as a basic part of the schedule. Particular care should be paid to any endocrine state present. Sometimes the use of a small dose of thyroid will give surprising results in these cases. The question of syphilis must always be considered. Its diagnosis will be materially facilitated by a careful investigation of other areas, notably the pupils, etc. It should be borne in mind that syphilis has a special predilection for the spinal roots. Funiculitis is more often associated with tuberculosis. Of course in specific cases we would in addition to the physical therapy have recourse to antispecific medication, employing mercury, bismuth, iodides and arsenic. It is astonishing sometimes, how much relief will be obtained from the use of a tiny dose of adrenalin intravenously. It should be borne in mind that the treatment is apt to be a long one and the administration of opiates, especially morphine, hypodermically must be avoided wherever possible. One cannot be too watchful or

too thoughtful of the possibility of making a patient an addict, in addition to the trouble from which he is already suffering. It has been suggested that physiologic normal saline solution be injected epidurally in 10 c.c. amounts. Of this method of treatment I have no knowledge nor have I used intramuscular injections of alcohol (80 per cent) locally.

*Toxemia and Infection.* In any trouble of this kind it is very important that any source of infection and toxemia be very promptly relieved. To this end as far as possible all foci of infection should be attacked, especially those of the teeth and gums, tonsils, colon, prostate and pelvic organ. Every load that is lightened, every center that is removed, lifts the burden from the patient, tends to lessen the pain, reduces the need of stimulation and sedative drugs and increases the chances of recovery. To this end the drainage of the gall bladder by the Lyon-Meltzer method will, where there is infection, often times prove of very great assistance.

*Hydrology:* If the patient is still confined to bed, we may employ a salt glow generally, to the spine especially, and follow same with a fomentation and compress. The pain is frequently ameliorated by the use of the neutral full bath (94-96 degrees F.) which acts by its neutrality and nonthermic impressions in shutting off sensations arising from the periphery. As soon as the patient is up and about, we may begin more active hydiatic measures. To this end the incandescent electric light bath to free per-

spiration, followed by a salt glow with special attention to the spine and the various forms of showers, rains, sprays and douches will often times prove very effective. The temperature usually employed ranges around 102 to 105 degrees F. and 75-80 degrees F. for the cooler water. Until the patient is well on the way to recovery very cold water should not be employed and at no time longer than ten to fifteen seconds. One should be careful not to prolong the light bath or any form of hydrologic application if weakness and exhaustion or increase of pain is produced. I have seen very few cases that could not be gradually trained to stand active hydrologic measures. Outside of its influence directly upon the chronic radicular syndrome, hydrologic procedures are among the best reconstructive nerve tonics and favorably affect metabolism, secretion, elimination, etc.

*Static Electricity:* This is one of the best methods in the treatment of these cases. The treatment should be pushed to the tolerance of the patient. It should start with a very heavy direct spark applied to the entire spine and especially to the area involved in the radicular syndrome. The sparks should also be given over the area of pain but not as strong as to the spine. This should be followed by the static wave current, using both Leyden jars, with a sharp, concussor spark applied first through both arms holding a shepherd's crook, then by means of a plate of metal to both feet, and finally for a short period over the

painful spot or area in the spine, involved in the radicular inflammation. Sometimes patients have a reaction from such an application. This is usually shown by increased pain, which usually yields promptly to the application of heat in almost any form, although I have found that *infra red light* will more quickly relieve the reactive pain than almost any other form of heating procedure.

*High Frequency Electricity:* In this stage diathermy is the best method for the application of this form of electricity. We sometimes find that a counter-irritative effect is useful, using a *silvered vacuum tube* and going over the skin of the spine and the areas of pain so lightly as to produce a very short, warm spark. The result of this application is to produce rubefacient states with very marked relief to the patient. Equally good results if not better may be obtained from the *neon gas vacuum tube*. I rarely if ever employ the simple vacuum tube for these effects, as the others are so much superior in every way. After this treatment diathermy may be employed. The use of diathermy will have to be governed somewhat by the reactions of the patient. It will be observed that some patients cannot take a large dosage. These patients should be given from 500 to 750 milliamperes for fifteen to twenty minutes. Others will be found to tolerate heavier treatment. For these 1000 to 1500 milliamperes may be employed. It has been my observation that those cases that can take the larger doses do better than those that are compelled to



take the smaller dosage with longer treatment. For its general oxidative influence we may employ autocondensation, particularly if the patient is suffering from hypertension or arterial sclerosis.

*Galvanic Electricity:* The modern use of some currents has driven this most valuable modality into the back ground. This is to be regretted, as the chemical is one of the most powerful and useful of all the electric currents. In the use of the galvanic current in the radicular syndrome one electrode is placed over the seat of the radicular process in the spine and the other to embrace its peripheral manifestation. If there is very great pain I usually place the positive pole over the spine and the negative pole at the periphery. Both the electrodes should be large, well wetted, warm and closely applied. The current should be turned on very gradually through a rheostat and gradually turned off. The duration usually ranges from seven to fifteen minutes of which ten is a fair average. I sometimes combine with this method the *very high tension Faradic current*, using only that amount of current that is comfortably tolerated by the patient. The coil from which this current is obtained should be capable of lighting a medium-sized Geissler tube, otherwise the coil is of no value for this purpose.

*Diathermy-Galvanism:* We have spoken of the value of diathermy and galvanism used as individual modalities. These two electric currents are very greatly improved by their combination as a single treatment. The combination

of diathermy and galvanism combines the sedative, blood flooding, pain relieving, thermic and nutritional effects of diathermy, coupled with its deep intracellular and intraosseous heat, with the chemical or ionic effects of the galvanic. The result that is produced by this combination cannot be obtained by either *alone*. The sequence in the use of these two currents is very important. The diathermic treatment should precede the galvanic. The reason for this is plain. Its physiologic action is such that it acts as a preparatory and sensitizing influence, rendering the tissues more easily penetrable to the galvanic and enhancing its chemical and distinctive polar effects. It should be remembered that the point at which the greatest influence of the galvanic is desired should be the negative pole. *In the administration of the galvanic alone, the positive pole is usually placed upon the spine, but in this combination of two currents the negative pole should be placed over the spinal region, the seat of the radicular syndrome.* It is sometimes quite remarkable the immediate and positive influence of this form of treatment in its relief of pain, muscular spasm and circulatory defects in the part treated. Long experience in the treatment of radiculitis and the use of the various physical measures for its relief, have taught me to rely upon the above combination in a great many cases.

*Sinusoidal:* This current does not possess any value in the direct treatment of the radicular syndrome. However, it



has a useful field under certain conditions. In the chronic stage when the spinal joints, ligaments and muscles are stiff and difficult of movement it is without doubt the most useful method to secure exercise of the spine and is clinically helpful. I personally prefer the Morse wave generator. My experience has taught me that it is best to start with cam 1 and the electrodes over the spinal area and anteriorly. The cams I prefer and use are, first, number 1, then number 2 and possibly 7 or 8, but I always try and get the patient to a point where I can employ cam 3, which gives a short and reasonably strong surge to the exercise. The pads should be of good size, well wet, and the current gradually turned on and off. This is very important, as a sudden contraction may set up pain that will last for several days and delay recovery.

*Massage, Manipulation and Vibration:* From time immemorial man has used rubbing and in the same conditions for which the sinusoidal has been recommended manual or mechanical massage, manipulation and vibration may be employed. It should be very gentle at first and should be directed to loosening the muscular and fibrous structures, stretching the bony axis, in both directions. It is astonishing some times what comfort and relief is obtained by this measure. Spinal stretching by an extension couch or suspension after the Charcot method is also very useful in these cases and seems to influence the intraspinal circulation quite favorably. It will be re-

called that Charcot found that certain cases of tabes was greatly helped by suspension. He employed the head gear and arm straps of the old Sayre apparatus with a derrick-like arrangement and windlass for lifting his patient. From no inconsiderable experience in 35 years' practice and seeing many cases of tabes I feel certain that in the cases of tabes presenting more of the type of radicular irritation that it will be found that these cases are the ones to be benefitted by the suspension or spinal extension as described by Charcot. The modern extension couch will give the same results and is very much less trying on the patient.

*Radiotherapy:* It may be stated, I think without fear of contradiction, that radiotherapy is apt to convey to the minds of most physicians the treatment of malignant disease. Nothing could be a greater mistake. It is surprising how many diseases and disorders are helped by the administration of this form of physical therapy. Owing to its penetrating power this x light can reach the actual seat of the lesion within the spinal canal. It possesses marked analgesic properties and sometimes relieves pain in this syndrome in a marvelous manner. It is resolvable, acting upon the inflammatory lesion, relieving pressure, thereby liberating the spinal roots and nerves that are confined and compressed by the inflammatory processes of the sheath, periostium or cellular tissue.

If there is any evidence of trophic disturbance x rays must be used with very great care and discretion. A trophic sore

brought about by this means is a dangerous complication. Properly employed radiotherapy is a measure of great usefulness. The technique I have worked out and which has yielded most satisfactory results is the following: Commence with small doses, although the so-called small or ionizing dosage is not sufficient. Employ the following: Anodal distance 20 inches; spark gap 5 inches; filter 3 millimeters aluminum; protection three layers chamois skin; current of 5 milliamperes; time five, ten, to fifteen minutes, equaling 25, 50, to 75 milliamperes minutes. The treatments should be given twice weekly.

*Light:* Incandescent, high-powered 1500 watt, white or blue globe lamp or the electric bath cabinet may be employed. In my opinion this form of therapy is of little or no value and does not in the slightest influence the course of the disease. As a preliminary heating process to other measures it may be employed as desired. Infra red light is really valuable. I have seen it relieve pain and it seems to stimulate absorption. Used in conjunction with the x light it tends to prevent the ill effects of the x ray upon the skin, does not interfere with the x light action, and yet seems to supplement its effects. Especially in bedridden cases it will be noted how much relief of pain it gives, as well as producing general sedative and comforting effects.

*Actinic light* possesses no direct or inherent value in this trouble. It may be used for its general systemic effects and

to overcome any anemia or toxemia that may be present. The water cooled lamps should never be employed. The air cooled lamp with gradually increasing dosage may be used. Care should be taken not to blister the sensitive skin of the back, as one cannot readily tell how much trouble may arise or trophic disturbances develop.

*Rest and Exercise:* In some cases in the acute stage rest is compulsory. In the chronic stage, and by those practitioners who do not actively treat their cases, I think rest is often overstressed. Reasonable rest of the body as a whole may be of some help. If one understands by rest we mean immobilization by mechanical mechanisms or casts with the subsequent myotic loss of tone and atrophy, all one can say is that by such means nothing is gained, valuable time is lost and recovery retarded. To this statement one notable exception must be taken and that is in those cases suffering from tuberculosis. Here absolute immobilization is in my opinion a *sine qua non*.

*Diet:* Diet is of very little influence in these cases except in those that are very thin, greatly run down, highly nervous and whose nutrition is very low. Here we have a field for superalimentation and the Weir-Mitchell rest cure with its increased food consumption and combined with proper medication and physical measures not only aids the radicular syndrome but prepares the patient for his or her resumption of later activity.

*Medicinal:* Medicinal treatment is of little value except in syphilis. Here it becomes a basic part of the treatment and embraces the proper administration of mercury, arsenic, bismuth and other anti-luetic drugs. In tuberculosis of the spine, actinic light, calcium therapy, cod liver oil, feeding and absolute immobilization are the measures. A jacket later along relieves some of these cases remarkably. My experience, however, has been that early immobilization and the measures above suggested are the only ones to be followed and oftentimes prevent a distressing future incapacity. Outside of these two conditions medication is directed to any underlying causal condition or is purely symptomatic. It often resolves itself into the administration of pain relieving drugs and it may be here stressed that the greatest possible care should be taken to avoid the formation of an addiction. The patient should never be permitted, if this is possible, to know that he is taking an opiate. For this reason it is best to give the medication by the mouth and so covered with

other drugs as to permit of its reduction and discard before the patient is aware that it is being taken from him. Some of these cases develop mental irritability, due to pain and lack of sleep and often kept up by the incautious or indiscriminate giving of anodynes and narcotics, which to say the least, disturb metabolism and provoke an irritation calling for more of the drug.

*Surgery:* This is to be employed in a purely mechanical way to relieve pressure. Should a radiculitis be due to a neoplasm it should be surgically removed. Otherwise there is but little for surgery to do in cases of this character.

#### CONCLUSION

The radicular syndrome is a serious, painful and difficult disease to treat under ordinary conditions. Medicinal and the usual medical measures accomplish but little. By means of the measures herein applied singly or in combination, success usually crowns one's efforts where the treatment is carefully applied and persistently followed.

## DIATHERMY IN MEDICAL KIDNEY DISEASE

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IN the employment of medical diathermy in kidney diseases, we have a very powerful agent, but the success is contingent upon two propositions, (1) the selection of proper cases and (2) the selection of the proper mode of applying our heat produced by the high frequency currents. In order to explain that, it may be of some help to make a few remarks as to the normal and pathologic physiology of the case.

The task of the kidney, as you know, is to keep the concentration of the blood at the level most favorable for the functions of the body. The kidneys must, therefore, eliminate certain end products of the metabolism that are either of no further use within the system or if retained would act in a damaging way. All of these end products of metabolism are limited to a watery solution, consequently the kidney has in the first case to secrete or excrete these metabolic slags, and in the second place to produce the water necessary to rid the body of or to wash out these end products. In order to answer these dual demands, the kidney has a dual apparatus. One is the vascular system, functionally represented by glomeruli, and the other is the tubular system.

The glomeruli will produce the water necessary, at the same time the vascular

system will produce and secrete and excrete all the nitrogen compounds. If the vascular system is diseased, two functions will be impaired: (1) the sufficient production of water, (2) the elimination of nitrogen compounds. If the glomeruli become inflamed, the circulation will be impaired, not only in the glomeruli and the vasa efferentia, but Bowman's capsule will be bogged with epithelium.

How to apply diathermy is rather obvious. We are dealing with a disturbance in the circulation of the kidney. Consequently, our aim will be, by applying heat to the kidneys, to improve the circulation, to produce again an active hyperemia. We apply our electrodes directly over the kidneys and put on as much current as is necessary in order to produce the necessary heat and subsequent new flow of blood.

Quite often you hear it said that diathermy could not be applied where there is any blood flow produced or where a hemorrhage is to be expected. That does not hold true in glomerular nephritis. Here we want to promote blood flow through the kidneys; we want to relieve the congestion and the hematuria, which is the last manifestation of a curative agent. The bleeding itself is half the cure. The only precaution we have to take is this: In all cases of glomerular

\*Read at fourth annual meeting American College of Physical Therapy.



nephritis where there is an involvement of the vascular system of the kidney, the heart is to be considered. We know that a fatigued or strained heart is extremely susceptible to any interference of heat; consequently, if we have to deal with a bilateral glomerular nephritis and we use diathermy, we must be very careful not to overheat the heart. The nervous apparatus of a heart that has to work under a handicap is extremely sensitive, and by using too much current you may even produce a heart block or a collapse of the patient.

In dealing with a nephrosis, that is a degeneration of the epithelium of the tubuli, a very important factor has to be considered. These metabolic slags, these end products, that are carried to the kidney are not carried directly by the blood stream to the kidney. At first they are deposited somewhere in the body, mainly in the subcutaneous fibrous tissue. Then they are picked up again and carried for final disposal in the renal circulation.

What is the answer so far as application of diathermy is concerned? If the urinary salts are only temporarily deposited in the subcutaneous tissue; no further disturbance will occur. If on account of a disturbance of the capillary system, for instance, the chlorides are not carried away properly, but remain within the fibrous tissue, these chlorides will attract water and retain it and produce edema.

Where do we apply the high frequency current and where do we want to pro-

duce heat? It must be produced in the capillary system, mainly in the subcutaneous tissue. The production of heat over and within the kidneys does not mean much because we are not dealing with a vascular disturbance. We have to stimulate the general circulation and stimulate the capillary circulation in the subcutaneous fibrous tissue. Therefore, we have to use general diathermy, unfortunately called autocondensation, and local diathermy on the lower limbs. If edema should be present, we have to be careful in our dosage. It is not necessary to overheat. We stimulate the circulation without it.

Of course, the question arises, is it possible clinically to make a differential diagnosis between the diseases of the vascular system of the kidney and the glomerular nephritis? A differential diagnosis can be made in practically every case. It must be understood if a glomerular nephritis exists for any length of time, especially if it is very extensive, a nephrosis will follow, because the epithelium of the tubular system depends upon the vasa efferentia that emanate from the glomeruli. That is a secondary affair.

The main thing of interest is always the vascular system. What are the leading symptoms of disturbance of the vascular system? In a general way, there is always a hypertension, if they are suffering from a glomerular nephritis; even to a small extent there is always a high blood pressure. Second, there is always a retention of nitrogen compounds with-



in the blood. That is understood because it is the task of the glomerular and vascular system to eliminate these compounds. If the glomeruli are impaired in their function by ischemia, some of these nitrogen compounds will be retained.

Third, if you overload the patient with fluid, the proper and normal elimination of this fluid will be retarded. The glomeruli are impaired; consequently, the elimination of water will be impaired. Invariably in the urine we find blood. In acute cases we find blood microscopically. We find albumin, and all kinds of casts.

In nephrosis we always find a retention of chlorides because the epithelium cannot respond in a proper way to eliminate them. Nephrosis *per se* does not produce hypertension. Hypertension may be there incidentally, but it is not intimately connected with nephrosis.

There is one absolutely certain diagnostic item in the examination of the urine. In nephrosis invariably in the urine will appear lipoids, which never occur in vascular diseases, so the diagnosis is very easily established in each case, and although a little overlapping may occur, we always can find out the main issue.

So far as the diagnosis is concerned, I should like to mention one point that is often overlooked. It is believed that there is one single method which tells you all about the function of the kidney or its impairments. There is no such

thing. There is not one single method that will tell us the whole story about the kidney. Nobody would think of judging a heart simply by counting the pulse, and the kidneys, which are much more complex in construction and function, should not be judged simply by one test, especially the so-called phenolsul phonephthalein or color test. The color test collected as excreted from the bladder not collected per ureter as secreted from the kidneys does not mean anything in medical kidney diseases, for this reason: Part of any stain produced through the body in order to have it reproduced in the urine will always be partially retained and decomposed. Secondly, it will often happen that one kidney will eliminate all the stain and the other will not.

The only value of the color test is the contribution as to the differentiation between the activity of one kidney compared with the other.

Albumin in the urine does not necessarily mean any essential pathology of the urine. We know albumin will appear in the urine after extreme exertion. It will appear once in a while after a very brusque examination of the kidney if the kidney is somewhat bruised. Secondly, if there is any essential pathology within the kidney, the amount of the albumin is not proportionate to this destruction or the disorder within the kidney, but the appearance of albumin, if it is persistent, has a prognostic value. If the amount of albumin does not diminish, the prognosis is very bad.

As I mentioned before, the heating of the kidney is a very valuable aid; it is not a cure. It would be absolutely erroneous to neglect all the other measures that we have used to treat patients.

I am glad to call attention to one of the most common errors in this condition. If any kind of a medical kidney disease is diagnosed, usually the kidney is flushed out. The flushing out of the kidney is a two-edged sword. Quite often the patient who is suffering from nephritis, and fatigue of the heart, is filled up with water, the kidneys cannot eliminate, the heart is forced to propel an additional amount of fluid within the blood, and the heart may stop. It is not unusual to find a patient with blood in the urine, with hypertension, so filled up with water that he is gasping for breath. One of the main things in glomerular nephritis is to desiccate a patient. It is a very simple proposition. The glomeruli are impaired. Consequently, you do not wish to overburden this other plant. Try to favor it as much as you can. It requires absolutely no fluid; if anything, it needs reduction of the fluid. Do not give the patient any more than he absolutely needs.

The opposite is true in nephrosis. In nephrosis where the secreting power of the epithelium is impaired, where the kidney is not in position to adjust itself to the metabolism, there we want to give plenty of fluid because we want to flush out, we want to help the patient to eliminate the necessary amount of urinary

solids which he cannot do under the ordinary conditions.

Another mistake is the milk diet. Some patients with albumin in the urine are given three quarts of milk a day. That is a mistake in nephrosis. We want to withdraw the chlorides. If we do not introduce them by the mouth, the body is forced to eliminate the chlorides it has, and that is what we want to accomplish. Our milk contains great amounts of chlorides, so by giving milk we do just what we should not do. Instead of withdrawing the chlorides from the patient we give him an additional amount. Milk is to be used very judiciously.

Combination of diathermy with other therapeutic agents gives the finest results. We commit all sorts of errors if we try to treat every case after one pattern and think that one method is sufficient. We should not starve the patient and we should not overload him with proteins, but the application of diathermy with proper management of the cases and the proper approach will improve them.

#### DISCUSSION

DR. B. H. SHERMAN (Dexter, Iowa): Some things have come up in the discussion that have interested me. I am presuming that I have killed at least three patients; that is, three patients ought to be dead by now if all this holds true.

Within the last three weeks I treated a very severe case of aortic regurgitation. He had a very severe general anasarca. There was extreme dropsy. By the administration of rest and the usual procedures that we go through, this all cleared up except one thing. In all of these

cases you have more or less dyspnea. This man had very severe attacks of dyspnea. After this anasarca had cleared up, due to rest, I was greatly alarmed to have my patient still retain a high respiration. I had not seen him for three days, and I made a special trip out there to see him and found that the left lung was entirely filled. His respiratory rate was 40 times a minute. I thought my patient was getting along fine, all of his dropsy had cleared up, he was apparently easier, only he was quite short of breath. He had no cough. I could not conceive of pneumonia. I decided to use some diathermy and see what I could do with that lung. We started the diathermy a week ago Sunday. When I called upon him last Sunday, his respiratory rate was lower and the lung seemed to be clear.

The diathermy was applied over the precordium, beginning with a low amperage and gradually increasing it to 3,000 milliamperes. After a few weeks this 79-year-old patient was well. I understand that with such a dosage there was a possibility of heart block. Perhaps the author will digress enough to assist me here.

With respect to diathermy for nephritis, we have had a series of cases that we have carried through which seemed to be a revelation to me. All received diathermy plus all the other treatment that is usually given. Our results were encouraging.

DR. J. C. ELSOM (Madison, Wis.): I want to cite to you one very distressing case, and a fatal one, which has recently come to my attention. Some time ago it was my pleasure to speak to one of the county medical societies in northern Wisconsin concerning physiotherapeutic methods. I talked about diathermy. After I had finished talking to this medical group, I learned about this very distressing case. One of the doctors told me that he had a patient, a young woman possibly 30 years old, who had an inflammation of her left breast. Diathermy was recommended. She was given four or five treatments of diathermy with evident improve-

ment in the swelling of her breast. I think at about the sixth treatment she was placed on the table, the electrodes were placed apparently just as they had been before, the current was turned on, and as soon as the switch was turned on she gave a little gasp, and that was all. She was dead. I never heard of a case of the kind before in my life. I think it was recognized that this young woman had some organic heart trouble, the nature of which I do not know. But the doctors of that vicinity, of course, very naturally look upon diathermy in the region of the heart with very great disfavor because of this one distressing case. It happened that this young woman was a niece of one of the members of the medical society which I was addressing. The case received no notoriety, no publicity, because, as I suggested, there had been, before that, a diagnosis of some cardiac dysfunction. Of course, the doctor himself was extremely distressed.

DR. G. A. LARSEN (Hayward, Wis.): In giving diathermy on a heart with any valvular lesion I never have had any disturbances in the cases I have treated. But in the myocarditis or in the angina cases, I have had. I have had a few of them that have given some distressing symptoms. I have not had a fatal one, but I have had some that gave symptoms that were not exactly alarming, yet were somewhat distressing. In some of these cases I observed, from large doses of diathermy with a high milliamperage, symptoms of pressure through the chest, particularly of dyspnea. They felt weak. These symptoms have been so pronounced that I have not dared to give such large doses again, but I have invariably reduced them, and in that class of cases I always start with a small amperage and increase it.

In the few cases that I have treated with valvular lesions I never have seen any of those symptoms, although some of them have been bad cases. For some reason or other, they stand up very well, and I cannot explain it. I should

like to ask Dr. Kolischer for some information explaining such an observation.

DR. J. U. GIESY (Salt Lake City): I want to corroborate the last remarks that were made. I believe it is largely a matter of care. It is my opinion that in the bad heart, particularly the myocardial heart as opposed to the valvular heart, we must treat the heart very much as we treat a patient whom we are trying to influence with exercises.

In applying diathermy to the heart, I think if we start low and work up gradually and carefully we come back to the thing which Dr. Kolischer has emphasized so strongly, the influence of circulation and through the influence of circulation the influence of nutrition of the part.

That comes down to the same as any other thing which we are trying to influence by these electric modalities. It all hinges, after all, on circulation and nutrition.

I can cite a case of a woman suffering with what Dr. Pope calls the chronic influenza syndrome, a lung condition, with respiratory sounds on both sides, suffering with dyspnea, unable to sleep in the recumbent position. The x ray was negative. The lungs were slightly clouded, of course, but we couldn't get any positive diagnosis of tuberculosis. The heart sounds were normal, but the blood pressure was low, the hemoglobin was low.

We started with diathermy. On the third treatment, after a little too rapid stepping up, the woman became palid, dyspnea increased, and she was temporarily exhausted, weak, and in a state of what appeared to be a partial collapse. She was a bit frightened, and naturally the operator was a little disturbed too. When treatment was resumed we stepped up very slowly until later she was taking practically double the dosage which produced this effect, with improvement in every sense of the word. We may assume that a gradual and slow building up and stimulation improved the nutrition to a point where tolerance was increased.

DR. CURRAN POPE (Louisville, Ky.): I think the essential fact brought out in Dr. Kolischer's address is that physicians are too often led away in the idea of using diathermy in renal and other diseases and totally forget all of the older methods that have often times proved very efficacious long before either the discovery or use of this method.

Dr. Kolischer tells us in his terse and brilliant statement today to differentiate between these two conditions. He very likely, if he had taken a little more time and wanted to do it, would tell us also that perhaps if he thought there was a weakness in the cardiac apparatus and he also wished to get more blood through his glomeruli, he would give his patients some digitalis. With the discussion switched off to heart cases, if you are at all in doubt about giving diathermy to the chest and to the heart, give the heart the advantage of good, heavy digitalization before you commence the use of diathermy, and forget, as I say, your physiotherapy and remember that you are clinicians and physicians.

DR. GUSTAV KOLISCHER (Chicago): It is pretty hard to judge reports about methods. Every operator is a unit in himself. Furthermore, the amperage depends upon the size of your electrodes. It depends upon the conducting wires from your apparatus to the electrodes and so on, so that alone one is not sufficient to judge how much current goes into the body or how much heat is produced.

Angina pectoris is not a disease; it is a symptom. It may be due to calcification of the coronary arteries; it may be due to disturbances of the nerve centers. We may get definite results always due to the increase of the blood that is forced through the heart at a given time, but we know by clinical experience that if you overstep the limit, even to a slight extent, in cases where the muscles of the heart are diseased, you take a long chance. If you give a very low dosage the patient will feel comfortable during the treatment and will feel fine after the treatment. If you give too much, the pa-



tient becomes restless under treatment, begins to sweat, some of them become cyanotic on account of the overdilation of the heart, and afterwards they become very uncomfortable. It is absolutely unnecessary to give them an excessive dose. The patients do not always die, but they suffer. Gradually the patients get hardened to diathermy, and by and by you can increase your dose. Why take a chance unless you have

to? It is entirely unnecessary.

As to what Dr. Pope said about the medical treatment of kidney diseases, I just mentioned enough to maintain the connection with my paper. It is perfectly true that in many cases we increase the function by digitalis. It is one of the most helpful things in any kind of disturbance of the kidney.

Make your diagnosis; then act accordingly.

## HIGH VOLTAGE X RAY THERAPY CLINIC\*

ALBERT F. TYLER, B. SC., M. D.

Omaha.

I have come this morning to talk to you about deep x ray therapy. It is applicable in so many different kinds of conditions that I think it would be well to connect it up with the children's clinic which has just preceded, going later to some of the adult conditions.

*Case No. 1:* Enlarged thymus is very amenable to radiation; in fact this child came in with intense dyspnoea so that she could scarcely breathe, even in an upright position. Following a single treatment she began to breathe with great ease, showing that the obstruction had been removed by the contraction of the thymus gland. Figure 1 shows the case before treatment with the characteristic thymus shadow, and on the right the case after two x ray treatments, a few weeks' time having elapsed between the two plates. (Fig. 2.)

*Case No. 2:* This is a little patient who came in suffering intensely from

inspiratory dyspnoea. There were no physical findings except the increased area of dullness in the upper central part of the chest. This thymus is not so large as the one just shown, but it is very distinct. To your right is the same patient after treatment. This patient later died from another disease and we were privileged to have postmortem examination. We studied that postmortem with a great deal of interest because we wanted to see what had happened. At the postmortem examination it was impossible to find any thymic tissue, proving that it had been completely obliterated. (Figures 3 and 4.)

*Case No. 3:* We have here a third case showing the characteristic shadow in the upper part of the mediastinum, with straight sides above the heart and great vessels extending up to the clavicles. And to your right side we have the same patient after treatment. In this case the patient died of another disease, and we

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had the privilege of a postmortem examination and were not able to find any evidence of thymus tissue, either grossly or microscopically.

Now, we have two patients to show you, which demonstrate some of the things we are called upon to treat in adults. The first patient is that of a young man who had a sarcoma in the posterior aspect of the left thigh. This was removed surgically about a year and a half ago, and the patient was advised to have x ray therapy. He lived a long distance away, was very busy on a farm, and since there was no gross evidence of trouble he did not realize the necessity of following instructions. Later he came for x ray therapy because there had appeared a lump in the center of the original surgical scar. This lump was quite large, elevated above the surface, vascular in appearance and the skin unbroken—characteristic of a sarcoma. We treated this with radium, but it was very resistive so that we were compelled to treat it very severely. It disappeared,

however, and the skin healed. A little later when he came in for observation we noticed a cough. Whenever we have a patient suffering from malignancy who develops a cough we are pretty sure upon making a physical examination to find lung metastases, especially if this cough is non-productive. We found in this patient a very large area of increased density in the right lower lobe. This could not be determined by physical findings since the percussion note and heath sounds in that part of the chest were normal. We treated the lung too, and this is the result that we accomplished following deep therapy treatment. This has not entirely disappeared, and we know that we must go further, but we have accomplished that much with one treatment. Now, let us turn back to a discussion of what happened to his thigh. A couple of months after we had given him the last treatment in the hospital, he wrote me a letter saying that he had developed a sore place in the scar, and wanted to know what I thought about it. I had a pretty good opinion of what had hap-

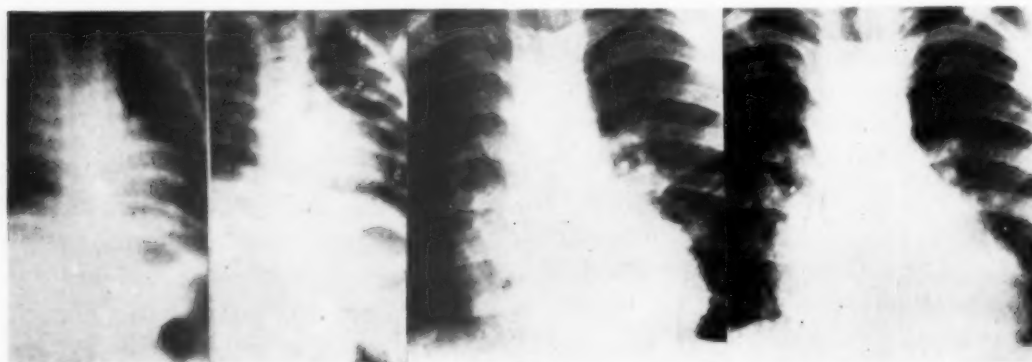


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Roentgenograms of enlarged thymus before and after x ray treatment.

pened so I asked him to come in. He is here. When he came we found one ulcer on the inner side of the thigh extending up and down for three and one-half inches and laterally about an inch and a half. We found another ulcer on the back of the thigh about three and one-half inches in length and an inch and a half in width. What kind of an ulcer is this? Many of the men call this an x ray burn; personally I think that is the wrong term to use for this kind of an ulcer, because it does not characterize the pathology of the ulcer. An x ray burn is always more or less acute, it follows within a few weeks. This type of ulcer frequently follows, not at once, but the patient will be well for six months or nine months, or a year. He will suffer trauma like a little scratch or a bruise or something of that kind in the area which has been radiated, and the scratch does not heal, but instead the tissues break down and the area becomes larger. Now, this is due to the effects of the radi-

ation, but is not a burn; it is simply a post radiation ulcer. It has the same pathology you get when you find an old man with arteriosclerosis, and he develops an ulcer on the leg; he has never had any x ray treatment, but he has the ulcer. It will not heal, due to the fact that the nutrition is shut off from that part. This is the same thing. The x ray acts on the tissues in two ways: (1) on the lining of the vessels, producing immediately after treatment, an intense swelling of the endothelium lining the small arteries. This swelling becomes so intense that within a few hours after treatment is given the lumen of the vessel is completely occluded. This means that we are starving the growth, we are shutting off its source of food supply by swelling up the arteries on the inside and shutting off their ability to carry blood. (2) The second action is then upon the cells of the growth themselves. If we examine the tissue under the microscope we find a cloudy appearance of the nucleus, a



Fig. 5.—Sarcoma of knee recurrent after 11 attempts at surgical removal. The growth protrudes

through the most recent surgical wound.

little later a rupture of the nuclear membrane, still later a cloudy swelling of the entire cell and rupture of the cell membrane and disintegration so that we can no longer distinguish the cells one from the other. Both of these processes are occurring simultaneously, and both of them then go on through the stage of repair and heal, healing taking place by the process of fibrosis. This means then that the end result of radiation on the tissues is fibrosis. This goes on for a long period of time, even after one has discontinued treatment. This case illustrates that very point; he was well for several months, later he developed an ulcer. This case also shows fibrosis of the muscles of his thigh. Notice the difference in the two thighs. The right one is soft and pliable, and has the usual feel of the thigh muscles; the left one is hard on the surface and feels harsh—the same process has taken place in the muscles. It means that these muscles do not now have their normal power of contraction, instead of being elastic tissue, they now are composed of fibrous tissue. I am showing this case because it illustrates some of the things that are bound to follow intense radiation, and there is no way that we can avoid it if we give enough radiation to kill the growth.

We should now consider the treatment of post radiation ulcers. When they first appear they are very painful because of the exposure of terminal nerve filaments; the patients complain more of the pain than of any other one thing. We can get

relief from that pain within two or three days' time by a very simple painless method of treatment, that is by treating the patient with the ultra violet ray. In this particular case the ulcer was not in condition for skin graft when he came in, for it was an infected ulcer. After two or three days' time under ultraviolet light the pain had disappeared and he has had no pain since that time. After a time healthy granulations began to spring up in the bottom of the ulcer. On the inside of his thigh the ulcer has healed over with new skin from the lower end up two and one-half inches. There is only a small open ulcer about three-fourths of an inch in diameter on the outer side of the thigh which will probably heal within the next week or ten days. The one on the back of the thigh will take longer. The lad wants to get home. We called a surgeon in to see him and tomorrow or the next day the surgeon is going to do a skin graft and cover these ulcers over with skin taken from the other thigh. This can be done under local anaesthesia without any pain to the patient and will save the lad probably three or four weeks' stay in the hospital. In this case the end result will be the same whether it heals with the skin graft or by radiation. Because we have treated this with radiant heat and massage until the skin of the thigh has become soft and pliable, the wound has a good healthy base and the putting of the new skin on will simply save time. We have also improved the condition of the muscles of the thigh 50 per cent since he came.

This has been done by daily treatment with the radiant heat and massage of the whole thigh. We have found in many cases where there is a lot of fibrosis in the soft parts we can soften this up and get rid of it.

The patient now before you is an interesting one; she is interesting because of the fact that she has an interesting history and has had a long series of treatment. I will pass around to you the photograph showing the condition when the patient was received at the hospital. This patient entered the hospital with the following history: The patient is a female, 33 years of age, who entered the hospital on September 29th complaining of the presence of a large cancerous growth on the inner aspect of the left knee; two years ago the patient noticed a small, soft, fairly movable mass on the inner side of the left patella. It was not painful, and it gave her no discomfort or interference in walking. A diagnosis of sarcoma was made at that time and operation advised. In two and one-half years since that time the patient has submitted to 11 attempts at surgical removal. The last took place in October of 1922. In December, 1922, the tumor was again noticed and in a short time the knee became markedly distended, and after several unsuccessful attempts to excise the cancer a large bleeding cauliflower growth appeared through the wound. (Fig. 5.) She cannot walk now on account of pain. The rest of the history is of no great interest to us. When the patient entered the hospital she was

very delicate, looked toxic and emaciated, weighing 115 pounds, and on account of the fact that the growth protruded out through the wound, as you see it in the photograph, and that it was soft, radium capsules were inserted into the tumor mass. After the radium had been removed x ray therapy was used in addition. Immediately following the application of the radium the patient developed a fever of 103, going up as high as 105. We thought she might have developed pneumonia; we held consultation with one of the internists and he was not able to find any signs of pneumonia. We concluded, therefore, that the temperature was entirely due to the re-action following the initial treatment and the absorption from the diseased area. Following the application of the treatment the temperature developed, as I said, and shortly thereafter, within 24 to 48 hours, I discovered that she had a point of fluctuation in the tumor; we inserted a large rubber tube and immediately a lot of dark colored, foul-smelling fluid came out together with a mass of necrotic tissue. This discharge continued through the tube and in order to get rid of the necrotic material as rapidly as possible we kept the wound open, and the patient has had daily irrigations, every two or three hours with Dakin's solution. Before we remove the dressing I want to show you the method that we employ for preventing skin irritation by the Dakin's solution, we have gauze thoroughly saturated in vaseline, and place this down against the skin. If we wish we can build the gauze up around the wound to



a crater-like shape so that the solution will not then irritate the surrounding skin. Now that the dressings have been removed you see the knee is practically normal in size, and that we have still an ulcer in the center. You will notice that there is no odor to the ulcer at the present time, that it is simply necrotic in character, gradually cleaning out. The patient now has a good color and weighs 130 pounds, so that the results so far have been very gratifying. We have not been able to demonstrate any mass in any other part of the body in this particular case. We are always on the lookout for them in all of these malignant cases, and in fact many of the cases which are referred to the hospital for deep x ray therapy have metastasis when they come in.

We have a third patient who happened to come into the hospital yesterday. This third patient is not one where deep therapy is necessary. It is one where superficial therapy is entirely satisfactory. He has, as you see, an indurated ulcer on the lower lip, slightly to the left of the median line. It is quite hard and indurated—characteristic of epithelioma. He tells me that he had a hard square patch on the lip for a number of years, but that it did not form an ulcer

and begin to grow until a few months ago; since that time it has constantly ulcerated and has shown some pain and bleeding. We are not able to feel any enlarged glands. Even though we do not feel enlarged glands we treat these cases as though we knew that the cancer had already metastasized, trying to follow the same principle as the surgeon when he excises the local growth and then does a block dissection of the glands. We can make the same block dissection with the x ray without leaving a scar and without pain or discomfort to the patient. In that respect I think the x ray has the advantage over the surgical treatment. So that when we prescribe the treatment for this patient we will prescribe treatment to the growth itself over the lower lip down in the immediate involved region, using what we call our superficial or skin technique. Our technique for that purpose is the employment of a seven inch spark gap, one millimeter of aluminum and leather, nine inch distance, five milliamperes for fifteen minutes; that is our routine superficial technique. For the treatment of the glands we use the nine and three-quarter inch spark gap, five milliamperes, six millimeters of aluminum and leather, nine inch distance, 15 minutes.



# EDITORIAL

## ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

A. R. HOLLENDER, M. D., Editor  
ALBERT F. TYLER, M. D., Managing Editor

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### FRANZ NAGELSCHMIDT

The visit of Franz Nagelschmidt to the fifth annual meeting of the American College of Physical Therapy is an event of great importance to physical therapy in the United States. Called by many the "Father of Diathermy," it is indeed fortunate that American Physicians have this opportunity to sit at the feet of such an able pioneer. It is of great moment that Dr. Nagelschmidt has consented to assist in the course of instruction as well as to appear on the regular program. Altogether those who attend the meeting have an opportunity to hear him several

times on various phases of physical therapy.  
A.F.T.

### WIDE INTEREST IN PHYSICAL THERAPY

The hundreds of inquiries coming into the College offices indicate a keen interest in physical therapy. Everywhere the thirst for sound, trustworthy information is at hand. The noteworthy contributions of Steinbach, Hess, Bovie and others have opened the eyes of physicians to the value of physical agents in the prevention and treatment of disease.

Research work by scientists of the highest ability forms the foundation for clinical application. Accurate knowledge of the physiological action of the various forms of heat and light is just as essential as the knowledge of the physiological action of drugs. The physician is very careful to prescribe the proper dosage of mercury and arsenic. He should be equally accurate in prescribing doses of physical agents. The various forms of light have already been accurately measured so far as their wave lengths are concerned, but the physiological effects of the various portions of the spectrum need further study.

The work of Barenberg, Friedman and Green, New York, is an illustration of the kind of study needed to make us all more certain of the way in which to apply physical measures. This article suggests the possibility of doing great good by proper doses of ultra violet and of doing great harm by over dosing. It also suggests the need of a proper interval between treatments. Work of this type can be carried on at most any hospital where physical therapy is available and where close co-operation exists between the clinicians and the laboratory. It is to be hoped that many will take up a careful study of the physiological action of the various physical agents used in medicine.

A.F.T.

#### MASSACHUSETTS MEDICAL SOCIETY HAS RADIOLOGY AND PHYSIOTHERAPY SECTION

It is interesting to note that the Massachusetts Medical Society has established a section of Radiology and Physiotherapy. At its annual meeting, held in Springfield, June 9, Dr. Edwin T. Wyman of the Children's Hospital, Boston, read a paper in this section on "Clinical Application of Ultra Violet Rays;" Dr. William D. McFee of Gale Hospital, Haverhill, one on "Diathermy in Medicine," W. T. Bovie, assistant professor of bio-physics, Harvard University, one on

"Physics of Ultra Violet Light." Dr. L. B. Morrison, Boston, is chairman and Dr. F. B. Granger, Boston, secretary of the section.

#### AMERICAN JOURNAL OF SURGERY

The influx of July journals brings with it an old friend under a new title. We welcome the expansion of the *Journal of Surgery* into the *American Journal of Surgery* "devoted to general and industrial surgery and physical therapy" under the associate editorship for physical therapy of Dr. Norman E. Titus of New York.

Such an innovation marks the recognition by another of our general medical publications of the efficacy and rationale of the science of physical therapy, the *Medical Herald* under the leadership of Dr. Chas. Wood Fassett, and *The Western Medical Times* with Dr. William Martin having previously led the way.

Gradually physical therapy is coming into its own. Through the leadership of careful scientific medical practitioners, guided by ideals of recognized physiotherapeutic organizations, presented by authentic publications, physical therapy is gradually receiving its rightful recognition in the armamentarium of medicine.

# THE STUDENT'S LIBRARY

## BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

**OLD MASTERPIECES IN SURGERY.** A collection of thoughts and observations engendered by a perusal of some of the works of our forebears in surgery. *Alfred J. Brown*, M. D. Privately published, Omaha, Nebr., 1926.

**PHYSICAL THERAPY IN DISEASES OF EYE, EAR, NOSE AND THROAT.** By *A. R. Hollender*, M. D., Attending Gynecologist, American Hospital of Chicago, Editor Archives Physical Therapy, X Ray, Radium; and *Maurice H. Cottle*, M. D., Attending Otolaryngologist, Illinois Masonic Hospital, Chicago. Cloth. Pp. 307 with 81 illustrations. New York: Macmillan Co., 1926.

**FRACTURES OF THE HUMERUS, RADIUS AND ULNA.** By *Eldridge L. Eliason*, A. B., M. D., Sc. D., F. A. C. S., Professor Clinical Surgery, University of Pennsylvania Medical School; with the collaboration of *Ralph Goldsmith*, M. D., Instructor in Surgery, University Pennsylvania Medical School; and *Eugene P. Pendgrass*, M. D., Instructor in Radiology, University Pennsylvania Medical School. Cloth. Pp. 307 with 303 illustrations. New York: D. Appleton & Co., 1926.

**THE TREATMENT OF FRACTURES.** *Tenth Edition, Revised.* By *Charles L. Scudder*, A. B., Ph. B., M. D., F. A. C. S., Consulting Surgeon to Massachusetts General Hospital; Formerly Assistant Professor of Surgery at Harvard Medical School, etc. Cloth. Pp. 1240

with 207 illustrations. Philadelphia: W. B. Saunders Co., 1926.

**FUNDAMENTALS OF DERMATOLOGY.** By *Alfred Schalek*, M. D., Professor Dermatology and Syphilology, University of Nebraska College of Medicine; formerly Assistant Professor Dermatology, Rush Medical College. Cloth. Price \$3.00. Pp. 239 with 54 illustrations. Philadelphia: Lea & Febiger, 1926.

**THERAPEUTICS, MATERIA MEDICA AND PHARMACOLOGY.** Fourteenth Edition. *Sam'l O. L. Potter*, A. M., M. D., M. R. C. P. Lond. Revised by *R. J. E. Scott*, M. A., B. C. L., M. D. Cloth. Price \$8.50. Pp. 972. Philadelphia: P. Blakiston's Son & Co., 1926.

**ATLAS OF HUMAN ANATOMY.** By *Carl Toldt*, M. D., assisted by *Professor A. D. Rosa*, M. D. Adapted to English and American and International Terminology by *M. Eden Paul*, M. D., Brux., M. R. C. S., L. R. C. P. Two Volumes. Cloth. Price \$10.00 per set, formerly \$24.00. New York: MacMillan Co., 1926.

**TEXT BOOK OF UROLOGY.** By *Oswald S. Lowsley*, A. B., M. D., F. A. C. S., Director of the Department of Urology, New York Hospital, etc., and *Thomas J. Kirwin*, Ph. C., B. S., M. A., M. D., Chief of Clinic of Department of Urology, New York Hospital. Cloth. Price \$10.00. Pp. 669 with 233 engravings and 13 plates. Philadelphia: Lea & Febiger, 1926.

**MEDICAL DIAGNOSIS.** Third Edition, Entirely Reset. By *James M. Anders*, M. D., Ph. D., LL. D., Professor Medicine, Medico-Chirurgical College Graduate School of Medicine, University Pennsylvania; and *L. Napoleon Boston*, A. M., M. D., Associate Professor of Medicine, Graduate School of Medicine, University Pennsylvania. Cloth. Price \$12.00. Pp. 1422 with 555 illustrations, 21 in colors. Philadelphia: W. B. Saunders Co., 1926.

**UROLOGY.** By *Edward L. Keyes*, M. D., Ph. D., Professor of Urology, Cornell University Medical College. Cloth. Price \$8.00. Pp. 781 with 190 illustrations in text and 18 plates, four colored. New York: D. Appleton Co., 1926.

**OPERATIVE ORTHOPEDICS.** By *A. Steindler*, M. D., F. A. C. S., Professor of Orthopedic Surgery, State University of Iowa. Cloth. Price \$7.50. Pp. 403 with 83 plates and illustrations. New York: D. Appleton Co., 1925.

**PRACTICE OF OBSTETRICS.** Sixth Edition. By *J. Clifton Edgar*, Emeritus Professor of Obstetrics and Clinical Midwifery in Cornell University Medical College, etc., revised by *Norris W. Vaux*, Clinical Professor of Obstetrics, Jefferson Medical College. Cloth. Price \$8.00. Pp. 779 with 684 illustrations, including 5 colored plates and 38 figures printed in colors. Philadelphia: P. Blakiston's Son & Co., 1926.

## BOOKS REVIEWED

**FACTS ON THE HEART.** *Richard C. Cabot*, M. D., Professor of Medicine and of Social Ethics at Harvard University. Cloth. Price \$7.50. Pp. 781 with 163 illustrations. Philadelphia: W. B. Saunders Co., 1925.

The thoroughness of study, the evaluation of altered states and the logical correlation of these symptoms with possible pathological conditions has created for Dr. Richard C. Cabot a recognized and enviable diagnostic ability. Particularly has this ability been consistently demonstrated on cardiac conditions. This text characterizes his work.

The necropsy records on all cardiovascular lesions were first analyzed. From the post-mortem diagnoses, he worked back into the clinical records.

Reviewing the facts demonstrated by 1906 necropsies on cardiovascular subjects and associating these findings with the previous clinical records, reading the existing pathology into the altered physiology, valuable deductions were made.

For the busy practitioner and hurried reader, these established facts are presented in abstract

form in the introductory and last chapters. For the scientific practitioner and investigator these comparative observations are grouped in the intervening pages. For the student the illustrative cases with their clinical records, deductions and pathological reports are presented.

This text presents the most definite information on diseases of the heart and circulatory system.

**THE TECHNIC OF ORAL RADIOGRAPHY.** *Clarence O. Simpson*, M. D., D. D. S., F. A. C. D., St. Louis, Mo. Cloth. Pp. 207 with 165 illustrations. Price \$5.00. St. Louis: C. V. Mosby Co., 1926.

In the preface of the text the author states that the purpose of this book is to present a systematic technic for practical instruction in dental schools, and for the guidance of dental practitioners that they with the least difficulty may obtain the most service from radiography. In the realization of such an object, a preliminary discussion of the necessary equipment is conservatively given. Intra and extra-oral examinations are detailed, all being taken in the

upright position. In the intraoral examination, 16 films are routinely taken. These positions and prints are elaborately illustrated. Extra-oral examinations are assisted with the adjustable stool and stand. An important consideration in the production of good diagnostic radiographs is perfect dark-room technic. The conservative detail coupled with instructions for regional examination listed opposite the illustrations makes this text a practical reference and text for radiodontia instruction.

**ROENTGEN INTERPRETATION.** Third Edition. *George W. Holmes*, M. D., Roentgenologist Massachusetts General Hospital, and Assistant Professor Roentgenology, Harvard Medical School; and *Howard E. Ruggles*, M. D., Roentgenologist to the University of California Hospital and Clinical Professor Roentgenology, University of California Medical School. Cloth. Price \$5.00. Pp. 326 with 226 illustrations. Philadelphia: Lea & Febiger, 1926.

The purpose of this text, according to the authors, is to present a brief survey of the field of roentgen ray diagnosis. Only the essential points are considered, the more detailed texts, monographs and current literature being relied upon to supply further data. References are included throughout the text for those who desire further study.

The illustrations that are included in the text are not all typical, but may show phases in a process. A comparison of plates with those in the text is therefore impractical. Such is almost always the case. Variations in equipment, variations in set-ups, different dark room technique, all force upon one individual standards. But the skill of the roentgenologist is not alone in taking a good roentgenogram. The ability to interpret and vivify the flat plate, to read from it the pathological process that is going on and to associate these observations with the patient under consideration, making logical deductions therefrom—these things measure the skill of the roentgenologist.

There is no doubt that the authors are too modest in their statements as to the scope of their text. We have yet to review a text which presents the salient principles of roentgen interpretation so clearly and concisely.

**MODERN METHODS OF AMPUTATION.** *Thomas G. Orr*, A. B., M. D., F. A. C. S., Professor Surgery, University Kansas. Cloth. Price \$3.50. Pp. 117, with 125 illustrations. St. Louis: C. V. Mosby, 1926.

This is one of the most practical monographs that it has been our pleasure to review. Brief and concise, it renders available to the surgeon who does only an occasional amputation the simple and accepted method whereby good functional results may be obtained. Throughout the work, special emphasis is correctly placed upon functional results. Attention is given to the preparation of the patient, the selection of skin flaps, the utilization of muscle and fascia, the proper care of the nerves and the treatment of the bone to avoid painful stumps. Amputations of the upper and lower extremity are discussed and an abundance of drawings inserted which greatly assist in elucidating the methods. Cinematoplasty amputations are mentioned only to acquaint the reader with the work that is now in the experimental stage. Artificial limb fitting is briefly presented only to further emphasize that the job of the surgeon is not finished until the patient is fitted, if possible, with an artificial limb. The organization of only accepted methods of amputation in such a readily available and comprehensive manner classifies this text as one of the most practical of modern monographs.

**FUNDAMENTAL CONCEPTS OF PHYSICS.** *Paul R. Heyl*, Ph. D., Physicist of the Bureau of Standards, Washington, D. C. Cloth. Price \$2.00. Pp. 112. Baltimore: Williams & Wilkins Co., 1926.

It has been said that the way to meet the increasing mass of things to learn is to specialize, to concentrate upon a few and to let the



others go. With this concept the author disagrees; for the ultimate result of specialization is logically the narrowing of the view of the scientific worker so that he fails to produce, or even to appreciate the broad generalizations upon which progress depends, requiring progress to eventually cease. To avoid this, one should "by struggle acquire the speed of the genius, increase our grasp in proportion to the demands made upon us, and visualize more broadly as more objects present themselves to our vision." Such are not the attributes of perfection, these are possible and practical; "it ill becomes a man of such ancestral tradition to call any requirement impossible . . . for there are minds which have produced these concepts and laid out these generalizations; there are many more who while they cannot produce, are able to follow. The rest of us are confronted with the stern alternatives of keeping up with the procession or falling out."

Specialization he considers, no longer furnishes a refuge. "How are we to acquire the necessary perspective, . . . it seems to me that the only practicable way is to regard the subject as broadly as possible in the light of its historical development." With such a preface the writer proceeds to revive the eighteenth century—the century of materialism, the nineteenth century—the century of correlation, and the twentieth century—the century of hope . . . out of which he develops the fundamental concepts of physics.

#### ESSENTIAL FACTS ABOUT CANCER.

A handbook for the medical profession. Prepared by the *American Society for the Control of Cancer*, 25 West 43rd St., New York.

This book, designed by a committee appointed by the National Council of the American Society for the Control of Cancer, intended to disseminate to physicians the general facts about cancer and its manifestations in the different situations where it most commonly occurs, has done more than any other single work to assist in the control of cancer.

The first edition published jointly by the American Society for the Control of Cancer and the Council on Health and Public Instruction of the A. M. A. in July, 1919, has been issued to about 40,000 physicians. The present revised edition presents the increased knowledge of cancer and its treatment, offering in general terms the expectation of success attending the radical operative treatment of cancer in each of its different situations.

To Doctors R. B. Greenough, James Ewing and J. M. Wainwright we are directly indebted for this text.

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MEDICAL ELECTRICITY AND RADIOLOGY. *James R. Riddell*, F. R. F. P. S., Lecturer on Electrical Diagnosis and Therapeutics, Univ. Glasgow; Radiologist West Infirmary, Glasgow; etc. Cloth. Price \$2.75. Pp. 239 with 110 illustrations. New York: William Wood & Co., 1926.

This text is prepared for the medical student. It fulfills a definite purpose. Presenting a brief survey of the physical agents which are employed in the practice of medicine, stating the conditions under which they are of service, advising how much to expect of them, and giving only in cursory manner their application, it serves to start the bewildered student upon the right track. Too often the detail of the physical principles so screens the medical aspect and commands the student's attention, that interest and understanding are lost. A preliminary acquaintance with the elementary essential facts are clearly presented in this text.

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PRACTICAL ULTRA VIOLET LIGHT THERAPY. *T. Clyde McKenzie*, M. B., Ch. B., and *A. A. King*. Cloth. Price \$2.50. Pp. 108 with 19 illustrations. New York: William Wood & Co., 1926.

This little book is designed as a handbook for medical practitioners. After discussing the materials used in ultra violet radiation therapy, three types of lamps are described. Their construction, physical principles, operation, ad-

vantages and disadvantages are given. The problem of dosage is discussed and a simple method for testing the strength of the ultra violet rays and sensitization of the patient is offered. The diseases to which ultra violet radiation is considered applicable are discussed and their treatment concisely outlined.

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**ELECTROTHERMIC METHODS IN THE TREATMENT OF NEOPLASTIC DISEASES.** *J. Douglas Morgan*, B. A., M. D., Formerly Radiologist, Ross Pavilion, Royal Victoria Hospital, Montreal; Instructor in Radiology Univ. Pennsylvania Graduate School of Medicine, Philadelphia, etc. Cloth. Price \$2.50. Pp. 172 with 36 figures. Philadelphia: F. A. Davis Co., 1926.

In the preface of the book, the author notes that the "object of the book is to supply to the medical profession, in general, a statement of the value of the electrothermic methods, a short account of the means by which dessication and coagulation are produced, and the manner of their application." In his attempt to fulfill this object, a short summary is given of the physical principles underlying the application of electrotherapy—a summary insufficient for one not previously versed—followed by an itemization of the conditions to which electrodesiccation and electrocoagulation are applied. The writings of others have been thoroughly perused and

their practices liberally used in the compilation of this work.

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**MRACEK-JESIONEK ATLAS UND GRUNDRISSE DER HAUTKRANKHEITEN.** By *Dr. med. Paul Mulzer*, Professor of Dermatology and Syphilis, University of Munchen. Cloth. Pp. 260 with 109 colored illustrations on 52 plates and 85 figures. Munchen: J. F. Lehmanns, Verlag, 1924.

After discussing the histology and physiology of the skin, the author describes the primary and secondary lesions—terms used in characterizing the dermatological conditions. Under a chapter on therapy, the drugs common in dermatological use are presented together with indications for their use. Prescriptions illustrating their composition in usable form are given. To this discussion is added one on the various forms of utilizing their usefulness, their local and general application. Such basic subjects occupy the first 38 pages of the text.

The various dermatological diseases are presented from their etiological, pathological, symptomatological, diagnostic and therapeutic points of view. The unique element of this text is the manner in which the illustrations are prepared. Many of them old cuts, they strikingly depict the clinical pictures that are so difficult to visualize. Such an atlas should be a great help to the student in his study of dermatology.

# INTERNATIONAL ABSTRACTS

## LIPIODOL

**Lipiodol in the Diagnosis of Chest Disease.**  
**H. F. Ruggles, M. D., and Lloyd**  
**Bryan, M. D., Calif. & West. Med.,**  
**23:1280-1281, October, 1925.**

There are two methods used for the introduction of lipiodol into the bronchial tree. In one, a large curved trocar is introduced through the cricothyroid membrane under local anaesthesia and the oil injected through it into the trachea. The second method consists in cocainizing the larynx and introducing the oil into the trachea under direct observation. The author prefers the latter method.

With the patient in the upright position, about 30 to 40 c. c. for adults is injected. Consisting of 40 per cent iodine in a vegetable oil, the mixture is heavy and settles to the dependent portions of the tree. It is essential, therefore, especially in bronchiectatic cases to obtain drainage from posterior the bronchial tree previous to injection. Lesions in the lower lobes are rather easily filled, but lesions in the upper lobes fill with difficulty. If possible the patient should be placed so that the suspected area is below the level of the trachea and the injection made slowly in this position so as not to produce a coughing reflex. Multiple injections may be necessary.

In the normal patient, the fluid gives a thin coating to the larger bronchi, and in filling the smaller ones produces a diffuse, flocculent shadow which is characteristic. Dilated bronchi are obvious, and the multiple grape-like masses in small bronchiectatic cavities are easily recognized. This method is particularly valuable in lesions of the left base behind the heart and diaphragm, an area which is rarely seen in routine chest films.

The iodine remains in the bronchial tree for some time and seems to have a beneficial therapeutic effect.

In the discussion of the article, Dr. Gelston of San Francisco presents his experiences with Armand-Delille of Paris in studying the bronchial tree of children. In France the routine method is the cricothyroid membrane route rather than the transglottic.

## NORMAL LUNG MARKINGS

**An Experimental Study of the Marking Seen in Roentgenograms of the Lungs of Normal Dogs.** W. James Marquis, M. D., *Am. J. Roentgenol.*, 14:247-250, September, 1925.

Into the lungs of normal dogs the walls of the main bronchi at the hilus only may cast a shadow in the roentgenogram. The bronchial walls in the outer portions of the pulmonary fields do not cause a shadow.

In roentgenograms of the lungs of normal dogs, the broad solid ramifying shadows seen radiating out from the hilus are caused in the main by the walls of the vessels and the blood they contain.

**Injury by Lipiodol as a Contrast Substance in Pulmonary Tuberculosis.** Otto Lichtwitz, *Wiener klinische Wochenschrift*, 39:133-134, January 28, 1926.

The intratracheal use of iodine-containing contrast substances in roentgen diagnosis of the lungs is described by a number of authors in a large number of observations as a harmless intervention. However, there have been re-

ports of secondary effects. Luger reported light iodism in a case in which a part of the solution entered the stomach; Landau reported two similar cases. Lenk and Haslinger reported "foreign body pneumonia" in a case in which the substance was retained too long. Lorey reported fever following the intervention. However, the author found no mention in the literature where the procedure favored the entrance of a lobar pneumonic process. Thus the case cited by the author is of interest.

A. F., aged 24 years, was admitted to the hospital on December 29. For three years she had suffered with apex pulmonary catarrh and costal pleurisy and for several months with cough, expectoration, fever and emaciation. After a thorough clinical and roentgenological examination, a diagnosis of pulmonary tuberculosis was made.

For six weeks following January 1, fresh air and arsenic treatment was used. The temperature was subfebrile. The patient increased one kg. in weight; the pulmonary process remained stationary. On February 13, for bronchographic purposes lipiodol was applied intratracheally. On the same evening the temperature rose to 101.3° F. On the following day her temperature rose to 103.8° F., pulse 116. The patient was in a weakened general condition with numerous small vesicular rales over the entire left lung. On February 15, the temperature remained unchanged. On February 17, the temperature was 100.6° F. and the patient felt better; on the left there were extensive signs of catarrh; on the right front, coarse pleuritic friction. From February 20 to March 23, the temperature remained subfebrile. On April 27 the patient was discharged as unsuitable for the hospital; this on account of her tuberculous condition which became severe.

In this case four c.c. of lipiodol was applied intratracheally. An acute impairment of the diseased condition in the sense of a lobar pneumonic complication followed the intervention.

After this complication was allayed the phthisical condition assumed a pronounced progredient character.

On the basis of this experience the author recommends that the use of this substance in patients suffering with pulmonary tuberculosis be avoided.

## GASTRO-INTESTINAL SYSTEM

### Diathermy in Stomatology. Budd C. Corbus, M. D., J. A. M. A., 85:1614-1618, November 21, 1925.

Diathermy means heating through. In its medical, sedative effect, diathermy may be mild and soothing; in its surgical, charring effects on tissue, it may be as fierce and destructive as lightning. In the milder application it is an impelling force unlike either galvanism or faradism, in that it causes neither pain nor contraction of tissue.

Two main forms of diathermy exist. Medical diathermy is the production of an internal heat. The natural method for production of heat is called fever, its function possibly being in part the production of an unfavorable environment for bacteria. Diathermy is artificial fever and is bactericidal. Other important functions are performed: absorption, solvency, nutritive assistance.

Surgical diathermy is the destruction of tissue by heat. Two methods of applying surgical diathermy are recognized: desiccation and thermo-electric coagulation. Desiccation, according to George A. Wyeth, is especially valuable in removal of lesions about the face, neck and hands. Warts, moles, pigmented nevi, papilloma, keratoses, those common blemishes which, unsightly in themselves, are menacing because they may become malignant. In all malignancies, whether superficial, or deep seated, thermo-electric coagulation should be employed.

## GASTRIC DIGESTION

**Normal Gastric Digestion.** Martin E. Rehfuß, M. D., J. A. M. A., 85: 1599-1603, November 21, 1925.

In the study of normal or pathological gastric digestion, two methods are essential. The roentgen ray examination is a study of the anatomical function of the organ. The anatomic diagnosis of the stomach gives its form, size, position and any alterations in contour. The functions that can be observed roentgenologically are tonus, peristaltic activity and emptying time.

The gastric analysis affords a physiologic study of gastric work. In studying the stomach in an effort to arrive at an intelligible diagnosis, both methods are essential.

## ABNORMAL COLONS

**A Clinical Study of Some Common Anatomical Abnormalities of the Colon. Low Fixed Cecum.** John L. Kantor, Ph. D., M. D., Am. J. Roentgenol., 14:207-215, September, 1925.

Observations made on a series of cases revealed the fact that low cecum is a common congenital anomaly of the colon occurring in 18 per cent of all patients. It was found that this anomaly occurs more often in persons of the asthenic habitus and is more common in women.

Patients with low ceca show a marked tendency to present certain reflex or toxic symptoms, the so-called auto-intoxication. The symptomatology is fairly definite. All through life they have been labelled as the "easy vomiters" or "neurotic vomiters," since the vomiting symptom is present in about 60 per cent. Approximately 48 per cent of these patients also suffer from headaches. An attempt to explain this symptomatology is futile; for the exact nature of this association between low cecum and the symptomatology described is not clear. Only the vague term *reflex* can offer any "scientific" explanation.

The presence of a low, and often, fixed cecum should be considered with such a vague train of symptoms. A diagnosis can be made only by the roentgen ray. As to treatment, surgery is not indicated. Appendectomy is often performed, but is seldom of benefit. Conservative medical treatment is indicated: rest, abdominal support, restoration of colon function, fattening cure, and antispasmodics and sedatives.

## HEMORRHOIDS AND ANAL FISSURES

**Hemorrhoids and Anal Fissures with Special Reference to the Desiccation Method of Treatment.** William L. Clark, M. D., Am. J. Electroth and Radiol., 43:327-331, Sept., 1925.

For sixteen years desiccation has been employed by Clark in the radical treatment of hemorrhoids and anal fissures. Every physician has seen the great postoperative discomfort suffered by patients sometimes for three weeks after operation, with occasional hemorrhage, stenosis of the rectum or embolism. The technique of Clark's avoids for the most part these complications. He infiltrates the sphincter muscle with a 2 per cent novocaine and adrenalin solution, using five equidistant injections to surround the anus, blocking the sensory nerves. The slight postoperative discomfort is explained by the fact that the trauma to the tissues is light as compared with the cautery, excision and ligature operations. Danger of stenosis is avoided because a contracted cicatrix does not result after the proper application of the desiccation method, since from a histological standpoint contracted scar tissue is in proportion to the amount of trauma and secondary inflammation produced, and the trauma to the tissues produced by the desiccation current is comparatively slight. Embolism is avoided because the dilated hemorrhoidal veins are completely destroyed and no chance is given for clotting. Secondary hemorrhage is avoided for the reason that the desic-



cating current penetrates for a short distance below the blades of the clamp, firmly sealing the vessels. The ordinary cautery seals the tissues superficially.

### GENITO-URINARY SYSTEM

#### **An Improved Application of the Use of Renal Fluoroscopy at the Operating Table. B. H. Hager, M. D., J. A. M. A., 85:1222, October 17, 1925.**

Application of fluoroscopy at the operating table to assist the surgeon in successful surgery for renal lithiasis has become practical. Using a modern bedside unit with a 10 milliamper Coolidge radiator tube and a 5 ma. current, the author described the procedure as follows: "As soon as renal exposure has been obtained, a nurse slips the Patterson head operating fluoroscope over the surgeon's head, a sterile cover having been slipped over the nose of the uroscope. The time required for accommodation is surprisingly short, much less than is usually anticipated. In persons in whom accommodation is slow, the nose of the hood can be folded back. A colored glass protects the eyes from daylight and allows sufficient for the surgeon to carry on his work. As soon as accommodation occurs, the hood can be extended and the fluoroscopic search for the stone begun. The method is simple, and does not interfere with surgical asepsis; it allows the surgeon to localize the stone in the kidney with his fingers, and to regulate the roentgen ray current with a foot switch."

### CARCINOMA UTERUS

#### **Mortality Rates of Carcinoma of the Uterus in California. Alfred B. Spalding, M. D., Calif. & West. Med., 23:1297-1299, October, 1925.**

In California, with an annual total number of deaths of from 52,000 to 54,000, it has been found that the total cancer mortality averages about  $8\frac{1}{2}$  per cent, which means an annual cancer death rate in the neighborhood of 4500.

The prognosis for early cancer of the uterus is so good and a fatal outcome for advanced carcinoma of the uterus is so bad, regardless of treatment, that the greatest hope for reducing the apparently increasing death rate seems to lie (1) in more frequent routine examinations by the family physician; (2) the prevention and eradication where possible of all local and general irritations; (3) the earliest possible pathological diagnosis in suspicious cases and (4) in proven cases, the preoperative use of radium and deep x ray followed in a few weeks by complete radical removal of the uterus and parametrium.

### BLADDER TUMORS

#### **Some Problems in the Management of Tumors of the Urinary Bladder. Paul A. Ferrier, M. D., Calif. & West. Med., 23:1303-1307, October, 1925.**

The view of the author is beautifully summarized in the following manner:

1. Papillomas should be fulgurated.
2. Malignant papillomas should be given a trial with fulguration and radium implantation through the cystoscope.
3. Papillomas which do not respond to the above procedure, multiple or extensive papillomas, those around the bladder neck, cases with uncontrollable bleeding or intolerant to cystoscopy should be treated by open operation.
4. Small cancers, favorably located, should have a cautery excision with meticulous care to avoid implants.
5. Multiple cancers confined to the bladder, especially if they involve the sphincter, call for total cystectomy.
6. Radium alone implanted through the cystoscope has had many apparent cures and is worthy of further trial in the hands of those who are prepared to implant needles accurately throughout the growth.
7. Deep x ray should cover the regional lymph glands in every cancer of the bladder.

8. Manifestly hopeless cases should not be tortured by ineffective measures. Cystostomy, nephrostomy, or nothing should be done.

9. Large cancers, having a reasonable amount of normal bladder and sphincter and one uninvolved meatus, should be removed by diathermy, followed by implantations of radium needles, through every cubic centimeter of tumor base, screened radium topically, supplemented by deep x ray therapy of the regional lymph glands. This method should supplant extensive resections and is, according to the belief of the writer, the greatest recent advance in the treatment of extensive cancers of the bladder.

### CIRCULATORY SYSTEM

#### Deep Roentgen Ray Exposure: A Differential Diagnosis of Mediastinal Tumors.

W. A. Evans, M. D., and T. Leucutia, M. D., J. A. M. A., 85:1215-1218, October 17, 1925.

An accurate diagnosis of mediastinal tumors was practically impossible before the advent of roentgenography. It has been learned that the variation in the sensitivity of the different tumor cells toward radiation, usually given for therapeutic purposes, enables certain conclusions with regard to the type of tumor, corroborating the previous clinical or pathological diagnosis.

In administering a standard quantity of radiation over different growths, there will be, because of the selective action of the rays, a variation in the reduction of the size of the tumors in the time unit, which is impossible to measure. According to the rate of reduction, the authors classify the mediastinal tumors in the following groups:

1. Tumors originating from the proliferation of the lymphocytic cell element of the mediastinal lymph glands or of the thymus (such as lympho sarcomas, thyomas, pseudoleukemia, lymphatic leukemia and simple lymphomas). These tumors entirely disappear within four to ten days following the administration of 90 to 100 per cent skin unit standard dose of roentgen rays over the tumor mass.

2. Tumors originating from the proliferation of the reticulo-endothelial cell element of the mediastinal lymph glands and thymus (Hodgkin's disease, Sternberg's type of hyperplastic tuberculosis, endothelioma). These tumors are reduced within ten days following the administration of a 90 to 100 per cent of a skin unit dose to within about one-half their original size, and then entirely disappear within six weeks following the exposure.

3. Other primary tumors of the mediastinum, such as sarcomas, originating from the areolar connective tissue (fibrosarcoma, large round cell sarcoma, alveolar cell sarcoma, carcinoma of the thymus or thyroid glands and teratomas). These tumors show a more or less pronounced reduction in size following the administration of the 90 to 100 per cent standard skin unit dose, but they rarely disappear at the period of six weeks following the exposure. In such cases, the radiation helps us in establishing the fact that a malignant tumor is being dealt with, but no accurate diagnosis can be made with regard to the type of tumor.

4. Benign tumors of the mediastinum (lipoma, chondroma, fibroma, adenoma, myoma, neuroma, dermoid cysts, etc.) or pseudotumors (aneurysm and encysted pleural effusion, chronic abscesses). These tumors are very little or not at all influenced by radiation.

A further differentiation of the tumors of the foregoing groups is possible in the majority of instances by clinical laboratory examination except for Group 4, in which surgical intervention is indicated.

### CARDIAC MOVEMENTS

#### The Investigation of the Movements of the Heart by the Use of the Slit Diaphragm and the Moving Film. Robert Knox, M. D., M. I. E. E., Brit. J. Radiol., 21:142-158, October, 1925.

This work has been carried on at the Cancer Hospital of London and presents a description and development of the apparatus, an explana-

tion of the method of recording the moving edges of the heart, a comparison with the tracings obtained by the electrocardiograph and the sphygmograph, and an intimation of the applicability of such an apparatus to other forms of movements of the diaphragm, the stomach, the duodenum and the colon. The material is presented in detail in the article and an attempt to abstract and present same in an intelligible manner would result in duplication of the article. The illustrations greatly assist its comprehension.

**Bone Tumors. Henry W. Meyerding, M. D., Minnesota Med., 8:628-633, October, 1925.**

In any bone lesion the question must first be settled whether the condition is benign or malignant. This can be done only after the exclusion of inflammatory lesions which may simulate tumor, and the differentiation of the local and general skeletal involvement, metastasis and location of primary tumors.

Most tumors of bone can be recognized by the roentgenologist, yet some defy recognition, so that careful history taking, clinical and laboratory examinations are essential. Surgical exploration is oftentimes necessary. The age, sex, trauma history, origin, site, size in or invasion through, osseous and periosteal tissues, osteoclastic and osteoblastic character of, and condition of the cancellous bone cortex and periosteum, are all factors worthy of consideration in determining diagnosis, prognosis and treatment.

The operability of the tumor is dependent on its local or general character; whether benign or malignant; it may be of a type, size or situation that will prevent surgical relief. The use of radium and x ray has become valuable in the treatment of certain types of tumors, independently, in combination or preoperatively or postoperatively.

The roentgenographic examination of the chest is especially important in cases of malignant tumors, as it gives the earliest evidence of

metastasis to the lung, a procedure which should be routine before operation, even in suspected cases.

To elucidate these contentions, the author presents and illustrates seven types of conditions: exostosis, chondroma, osteitis fibrosa cystica, giant-cell tumor, osteogenic sarcoma, multiple myeloma, and endothelioma.

### RICKETS

**Rickets. Joseph Garland, M. D., Boston M. & S. J., 192:581-588, March 26, 1925.**

In this article the author outlines the advancement of our knowledge of rickets, reviewing the historical elements, the prevalence and distribution of the disease, its etiology and diagnosis. In the diagnosis of this condition, the x ray is often used to corroborate the clinical findings. Inorganic blood phosphorous determinations and x ray examinations of the epiphyses are criteria of diagnosis. In the x ray there is a definite pathological picture. General rarefaction with disappearance of the sharp boundary of the diaphysis and fading away of the shaft of the cartilage is found. With the onset of healing a definite line, sometimes double because it is the boundary of a surface, appears on the epiphyseal side of this fringe. The end of the bone in active rickets may appear cupped, the cortex laminated, and the periosteum thickened and lifted from the cortex in a close resemblance to the findings in syphilis.

In the treatment of this condition, two measures are to be considered: radiation therapy and dietary. In the former class are ultra violet radiations, either the natural from the sun or the artificial from the lamp. In the latter class, cod liver oil and egg yolk occupy the essential elements. The ultra violet lamp is rarely available for large numbers of infants; the sun's rays are often unavailable; cod liver oil and egg yolk are practically always available, and some one of these agents should be employed daily, at least after the first month of life.

## TREATMENT OF FRACTURES

**Some Important Features in the Treatment of Fractures.** Fred S. Clinton, M. D., F. A. C. S., J. Oklahoma State M. A., 18:238-240, October, 1925.

X ray is recognized by both laity and professional men as the only safe method of determining the proper treatment of fractures. "The value of the x ray cannot be minimized, and we believe that every injury in which there is a slight suspicion of fracture should be radiographed. A picture confirming a diagnosis of no fracture is many times of great value to the employer or insurance carrier, as well as a great relief to the patient's mind. If a fracture is present, a lateral and anteroposterior picture should be had, before and immediately after reduction. It is our belief that subsequent radiographs at intervals of two to four weeks are almost invaluable for the intelligent conduct of any fracture. Many times changes in position of the fragments take place without apparent external manifestation, and it is very much easier to correct the position while the callous is still soft and pliable. It is also well to have a picture taken at the termination of the case. The realignment of fractures under the fluoroscope, while somewhat complicated, would be of great value were it not for the danger to patient and surgeon, which must not be underestimated."

It must be remembered, however, that the x ray, although it demonstrates bony deformity, does not show the extent of injury to the nerves, blood vessels, muscles and tendons.

## SKULL AND VERTEBRAL ROENTGENOGRAPHY

**Roentgenographic Examination of the Base of the Skull and Upper Cervical Vertebrae: The Gargoyle Position.** H. Flecker, F. R. C. S., M. J. Australia, 2:678-679, December 12, 1925.

A very simple method is devised, showing many important landmarks at the base of the

skull and upper cervical region previously undescribed or at any rate very little known by what is called the gargoyle position. This position consists in the use of the Bucky diaphragm, a complete immobilization of the head and a postaural removal of the mandible.

The patient lies on a Potter-Bucky diaphragm face downwards, with the arms fixed by grasping some objects at the sides. The upper part of the chest and front of the neck lie as close as possible to the surface of the trough. The chin is stretched upward as far as possible. It is this characteristic attitude which has suggested the name gargoyle position, and is designed for the purpose of placing the chin forward clear of the basi-occipital and basi-sphenoid regions, so that even the posterior edge of the vomer may be exposed behind the shadow of the symphysis menti. Incidentally the mandibular rami are drawn well forward clear of the greater wings of the sphenoid. Stereoscopic views are desirable, not alone for the three dimensions which one obtains in the stereoscope, but also because slight differences of angle at which exposures are made may show up more or less clearly different features on each film, if these are obtained separately.

## OSSEOUS SYSTEM

**Light in the Prevention of Rickets.** F. H. Humphris, M. D., F. R. C. P., D. M. E. & R., Am. J. Electroth. & Radiol., 43:263, July, 1925.

Rickets has been called both a calcium deficiency disease and a vitamin deficiency disease. In either case the rational prevention and cure, both from the clinical, experimental and theoretical views is ultra violet radiation. This may be obtained from nature's method, sunlight, or from man's artificial means—the ultra violet rays or cod liver oil. To summarize the author's reasons for the advocacy of light therapy for rickets, two statements may be made. Since rickets is a disease or aberrancy of the bony tissues due to, or characterized by a calcium and



phosphorous deficiency, as well as by a lack of the fat soluble vitamin-A, and since ultra violet therapy is one which raises the calcium and phosphorous content in the body and also increases the energy of the fat soluble vitamin-A, its application is rational.

**Cranial Rickets.** Henry E. Utter, M. D.,  
Boston M. & S. J., 192:602-605,  
March 26, 1925.

In his discussion of rickets, the author arbitrarily divides the condition into three classes, basing his classification upon clinical, roentgenological and chemical observations. Each period may overlap the preceding one.

In the first period, there are the clinical manifestations in the skull, with later roentgenological evidence in epiphyses and chemical manifestations, extending from the second to the seventh months. In the second class, there is the stage of healing rickets, as shown in the ribs and the epiphyses from the fourth to twelfth months. In the third stage, or the stage of deformities, the structural deformities appear from the ninth month upward to two or three years.

#### CALVE-PERTHE'S DISEASE

**The Clinical Observations After Healing of Calve-Perthe's Disease Compared With the Final Deformities Left by That Disease, and the Bearing of Those Final Deformities on the Ultimate Diagnosis.** P. Flemming Moller, M. D., *Acta Radiol.*, 5:1-36, January, 1926.

The author has collected 74 healed cases of Calve-Perthe's disease, 35 of them being cases of his own. The cases have been tabulated in such a manner that they can be divided, according to the final clinical result, into two groups: (1) Cases healed with good functional result; and (2) cases healed with poor results functionally.

The first of these groups comprises 58 cases, or 78.4 per cent of the total number. It repre-

sents cases in which there are no noticeable clinical changes left, beyond a slight dragging of the left in about one-half of the cases.

In the second group, which comprises 16 cases, or 21.6 per cent of the total, the disease has left the movement of the hip considerably restricted, as well as a permanent limp.

In seven of the cases belonging to this group the patients have nevertheless been able to get about freely; nor has either the claudication or the restricted mobility prevented them from attending to their usual occupations; but in the nine other cases there has not only been restricted mobility and claudication, but also continual pains in the hip and a reduction in the patient's working capacity.

In nine out of the 74 healed cases, about 12 per cent of the total number, the disease has thus resulted in a reduction of the patient's working capacity, besides in a considerably restricted mobility and continual pains in the hip.

This result, which takes into account only the immediate and purely functional consequences, show that Calve-Perthe's disease is by no means as innocent an affection as it has hitherto been considered.

If we take into consideration also the permanent deformities to the hip resulting from the disease and with the knowledge we now have concerning the subsequent history of the patients it becomes absolutely necessary to do so, if we wish to make its true prognosis. We shall find it necessary to alter the prognosis, even considerably for the worse; for the numerous cases now known of arthritis deformans occurring in hip joints deformed as the result of a Calve-Perthe's disease proved to what grave extent the disease can compromise the mobility of the patient in after life.

It can be safely asserted that the deformities resulting from a Calve-Perthe's disease constitute a lasting element of danger as far as predisposing the grave deformities, but also of the so-called perfectly healed, and even of the altogether latently developed and terminated cases.



## MASSAGE IN FRACTURES

**Massage and Movements in the Treatment of Fractures.** William Darrach, M. D., J. Iowa State M. S., 15:582-585, November, 1925.

As Dean and Associate Professor of Surgery of Columbia University, Dr. Darrach speaks with authority.

In the application of massage, Lucas-Championniere of France is the teacher followed. Three forms of massage are recognized: stroking, compression and percussion. In stroking there is first the superficial type to be employed. Soft, light centrifugal or centripetal strokes are gently made, attempting in a mechanical and reflex manner to aid the venous and lymphatic return. The deeper form of stroking should be used only in a centripetal direction, giving sufficient pressure to aid in the venous return but not enough to impede the arterial flow. By compression, kneading, friction and petrissage are included. The various forms of percussion massage do have definite indications and produce immediate results in the treatment of fractures. Muscular spasm is reduced; pain is reduced; the venous and lymphatic return is aided, edema is decreased and the general vasomotor condition is improved.

The customary treatment of all fractures should be:

1. Reduce the displacement at the earliest possible moment.
2. Immobilize the part by splinting, apparatus or operation.
3. Massage. In the immediate treatment, the gentlest superficial stroking to reduce the muscular pain, decrease the early swelling and simplify the reduction is indicated. At all times the supreme object should be "never hurt the patient." In the early stage deep massage should not be used except for obstinate or marked edema which does not respond to the lighter stroking. The compression forms of kneading should also be used.
4. Movement. The author advocates not the true passive or active motion. In his opinion it is better to encourage motion by the patient

guided by the attending physician. Assistive or resistive movements are perhaps the better forms.

Referring the patients to expert or professional masseurs with no instructions will produce as pitiful disabilities as improper reduction and splinting. "The proper use of these methods requires knowledge, skill, patience, judgment and gentleness. If any of these are lacking, the method had better not be used at all."

## MEDICO-LEGAL

**The Law and Medicine, With Special Reference to Radiology.** I. S. Trostler, M. D., F. A. C. R., F. A. C. P., Am. J. Physical Therapy, 1:563-567, March, 1925.

Supreme court decisions involving the application of the rules or statutes relative to privileged communications to radiologists and to radiological examinations and roentgenograms of interest are discussed in this article. Numerous states have rendered peculiar decisions that should be of interest to radiologists.

## ENDOCRINES AND SPECIAL SENSES

**Experimental Study with Some Physical Agents in Partial Deafness. Preliminary Report.** A. R. Hollender, M. D., and M. H. Cottle, M. D., Arch. Otolaryng. 3:338-348, 1926.

The experiences of some otologists with diathermy and other electrophysical agents in partial deafness have prompted systematic researches in this problem, with the chief purposes in view of determining not only the clinical value of these agents but also their scientific basis. Investigations were made on the use of diathermy, the sinusoidal current, galvanism, and ultra violet irradiations, either singly or in combinations, in all types of acquired deafness.

Theoretically, the area mostly influenced by a diathermy application may be estimated on a

model or skeleton of the parts with two wires. The wires are crossed so that the spaces between the ends will represent the size and position of the electrodes used. Where the wires cross will represent the region of maximum effect. The maximum heat area is posterior and medial to the middle and inner ear regions.

From the standpoint of clinical application, the experiments lead to several definite deductions:

1. Diathermy introduced by way of the ear canals does not reach the middle and inner ears with adequate intensity.

2. Diathermy introduced by an active electrode behind the external ear, with the indifferent electrode anterior to the ear on the opposite side, produces a substantial rise in temperature in the region of the ear from the middle ear to the inner surface of the skull.

3. With diathermy, the maximum temperature is reached only after ten minutes application.

4. With d'Arsonval currents of 300 to 500 milliamperes, there is practically no effect on the brain nor on the body temperature.

5. The highest temperature obtained was between the muscle and bone, where the increase was usually greatest.

6. In living tissue there is a return to normal temperature within twenty minutes; in dead tissue the change is much more gradual (up to two hours).

7. Under identical conditions, a d'Arsonval current produces higher temperatures in dead than in living tissues.

In the clinical experimental work with different physical agents, the cases selected for treatment were chiefly those of chronic catarrhal otitis media, usually with complete or partial fixations of the stapes; and some cases were clinically much like otosclerosis and partial nerve deafness. Many of the patients were previously treated by various methods and some had had operative work done on the nose and pharynx. Psychologic reactions were recognized, when possible, and their effects discounted. After six

months of observation, the following were the conclusions:

1. Negative galvanism was of slight benefit in a few cases.

2. The sinusoidal current in itself had little or no value.

3. Diathermy applied by the methods advocated heretofore, that is, via the external auditory canals, of doubtful benefit.

4. Local ultra violet irradiations to the ears have no therapeutic effect so far as hearing is concerned.

5. Body irradiations with ultra violet light may influence systemic dyscrasias, and thus act indirectly as an influencing factor.

The technique which is now employed is based on the results of laboratory studies. The electrodes of the apparatus which has been devised are so applied that the heat is not directed through the ear canals. Instead, the active electrode is placed in contact with the mastoid area of the ear to be treated, while the indifferent electrode is placed on the opposite side, anterior to the ear. Thus, only one ear is treated at a time. By means of this technique, theoretically, and practically also, the point of greatest heat is at the desired area, namely, the petrous portion of the temporal bone. From three to four treatments weekly are given, with a milliamperage of 300 to 400. The time of each diathermy treatment is thirty minutes, after which negative galvanism is applied for five minutes. The actual number of treatments necessarily varies, and can be determined only by the requirements of each individual case.

If improvement occurs, it is usually apparent to the physician during the third week of treatment. The hearing should be tested by the various methods at least once a week. One fact is definitely established if improvement is sought, and that is persistency in the treatment.

In general, it may be said that diathermy produces a localized heat in deep tissue, the penetration and degree of which are always under control. In treating an ear in which there are

structural changes in the mucous membrane to the point of fibrous connective tissue formation, or fixation of the ossicles, the purpose of applying diathermy is similar to that of treating a joint. Absorption of calcified deposits may be effected to such a degree that function may be partially restored at least. Furthermore, diathermy increases the arterial flow in the part treated, and augments the return circulation. Intercellular tension is thus altered and cellular activity stimulated. Again, it is fairly well accepted that sedative diathermy aids in the absorption of effusions, the softening of exudates and fibrous tissues, and in the relaxation of muscle spasms.

Syphilis, gout, uric acid disease, and other conditions, variously have been associated with otosclerosis. Attention has been directed to the relationship of the blood calcium to this type of impaired hearing. The contention of Leicher, that a deficiency in the calcium retention of the body is an etiologic factor, has been considered by many investigators.

Kopetzky and Almour, after their study, confirmed the conclusions arrived at by other investigators, that otosclerosis is probably associated with a calcium deficiency. Some writers, however, are inclined to believe that the most important etiologic factor is the deficiency of the fat soluble vitamin-A.

On the basis of the accepted local pathologic findings, and the recent investigations concerning the constitutional factors involved, it is quite obvious that more than local treatment would be necessary to influence the impaired hearing in otosclerosis.

Hence, treatment must be directed toward a correction of the constitutional error. General ultra violet irradiations were found of great value for this purpose, since it is now accepted that this agent influences the calcium retention in the body.

Treatment directed toward correction of any vitamin deficiency also influences selected cases. While diathermy locally, and ultra violet radiation generally, have appeared to be helpful in

some selected cases, it is not intended by this report to convey the idea that these measures are heralded as curative.

The beneficial effect of diathermy on nerve changes is problematic. Theoretically, its sedative action synergized with negative galvanism is indicated. Clinically, the application of these two agents has here been definitely empirical.

### RADIUM EMANATION

**The Effects of Radium Emanation on the Crown Gall Tissues. Michael Levine, Ph. D., Am. J. Rentgenol., 14:221-233, September, 1925.**

Short exposures of crown gall tissue, the plant cancer considered by many as analogous to animal cancer, to small doses of radium emanation (0.1 to 0.6 mc.) sealed in glass capillaries which are implanted in the crown gall tissue produce little effect on the surrounding tissues. Longer exposures and larger doses of the same active substance induce necrosis of tissues immediately surrounding the tissue extending progressively to a radius of 0.5 to 5 mm.

The visible microscopic effects resulting from the unfiltered radiation of radium emanation appeared to be caustic in effect. The general effects produced by radium emanation appeared similar to those produced in normal somatic plant tissue.

According to the belief of the authors, further studies should be undertaken to tend to eliminate the effects of the beta and secondary rays on this plant tissue.

### MEDICAL CRITICISM

**A Criticism of Modern Medicine. V. M. Synge, M. D., Irish J. Med. Sci., 6:20-28, January, 1926.**

This interesting discussion of the trend of modern medicine and medical education should be read by every practitioner associated with a medical institution. "The tendency of modern diagnosis is to neglect the evidence furnished

by signs and symptoms, and to place undue reliance on special tests. . . . X ray examinations stand in the forefront of these special tests. Since Roentgen's discovery, thirty years ago, the x rays have been of ever-increasing value in the diagnosis of disease. They have, however, their abuses as well as their uses. An efficient and experienced radiologist is essential. The fallacies are numerous in the hands of the inexperienced or uncritical; an epiphyseal line becomes a fracture, a normal root-shadow tuberculosis or neoplasm; or the obliging radiologist, who distrusts his own powers, finds what the clinician has told him should be there."

"X rays, by simplifying diagnosis, have made clinicians lazy. How often in gastric cases is the diagnosis left to the radiologist, because the clinician is too lazy to work out a clinical diagnosis for himself, or because he has become so dependent on radiology that signs and symptoms have for him little significance. The limitations of x rays are often not appreciated. There are lesions which they cannot show. A negative x ray is often found in a case of chronic appendicitis or of duodenal ulcer."

"The radiologist expresses an opinion. It is for the clinician to consider this along with his own opinion derived from the signs and symptoms, taking into account the results of any other special tests which are applicable, and, after weighing all carefully, to arrive at a considered judgment. If the x ray result is at variance with the clinical findings, the latter will usually prove the more reliable."

Such a sketch is only an indication of the trend of the entire article. Perhaps a little too severe at times, the article as a whole is well worth serious deliberation.

## ELECTROTHERMIC TERMINOLOGY

**The Terminology of the Electrothermic Methods.** J. D. Morgan, B. A., M. D., *Am. J. Electroth. and Radiol.*, 43: 335-338, September, 1925.

Much criticism has been made of late of the

extreme variability, flexibility and indefiniteness of physiotherapeutic and roentgenological terms. In the hope of standardiation, the author presents a few definitions that might well be repeated.

*Medical Diathermy.* The passage of a high frequency current through the tissues of the body for the purpose of raising their temperature to a physiological degree.

*Surgical Diathermy.* The passage of a high frequency current through the tissues of the body, using a pointed, active electrode in contact with or inserted into the tissues, for the purpose of raising the temperature near the electrode to such a degree as to destroy the tissue by desiccation or by coagulation, depending on the intensity of the current used.

*Endothermy*, used by Wyeth of New York, to signify the same as surgical diathermy, but employed to emphasize the fact that the heat is generated in the tissues themselves (owing to their resistance to the current) in contradistinction to the application of external heat, as with the electric cautery.

*Fulguration*, a term employed by Pozzi, de Keating-Hart, and others, to designate the bombardment of neoplastic tissue by sparks produced with the monopolar high frequency current with the intention (by the former) of destroying the superficial tissues, or (by the latter) of stimulating the growth of healthy granulation tissue after the removal of the neoplasm. The method depends for its results on the heat caused by the sparks, i. e. heat produced from without and not from within, the tissues. It is very frequently, and quite erroneously, employed to designate any form of surgical diathermy.

*Electrodessication*, a method originated by William L. Clark of Philadelphia, of employing a monopolar oudin current through a pointed needle electrode in such a manner as to produce a dehydrating effect only, in the tissue undergoing treatment.

*Electrocoagulation*, a method originated by Doyen of Paris and modified by Clark, of em-



ploying a bipolar d'Arsonval current in such a manner as to produce coagulation of the protoplasm of the cells and complete destruction of the tissue undergoing treatment.

*Monopolar Endothermy.* An additional current suggested by Wyeth of New York, for electrodesiccation, indicating the method by which it is produced.

*Bipolar Endothermy.* An additional term for electrocoagulation, indicating the method by which it is produced.

*Endotherm Knife.* The name given to the apparatus by which tissues section can be accomplished by using undamped oscillations. The result, however, generally considered to be brought about by molecular disintegrations and not by "heat from within," hence the term is a misnomer.

*Acusector,* an alternative, descriptive term, signifying "to cut with a needle."

*Radio Knife.* A trade name for the same apparatus. This term is a poor one, resulting in confusion and should not be employed.

## ROENTGEN RAYS IN DENTISTRY

**The Therapeutic Significance of the Roentgen Rays in Dentistry and Their Influence on the Human Body.** Dr. I. P. Bosthoef, *Dental Cosmos*, 67:797-805, August, 1925.

The author recommends for acute periodontitis and for pyorrhea a soothing treatment—one-fourth Holzknecht (designated H.)

For granuloma and for the stoppage of pus flow, one-half to one H. Concerning the treatment of the latter, the application can, on account of the small dose, be repeated one or two weeks later.

In beginning parulis one is not sure that roentgen treatment will relieve the suffering, but generally the ripening is promoted considerably, so that evacuation takes place one to two days earlier than normally.

## IN SURGERY

**Practical Application of Radiation Therapy in Conjunction with Surgery.** B. C. Conway, M. D., *Illinois M. J.*, 48: 264-269, October, 1925.

For convenience in the discussion of this important subject the writer divides the disease that he considers that can best be treated by a combination of surgery and radiation into: (1) glandular dyscrasias (2) benign tumors, and (3) malignancy.

In the first class of diseases he includes both the toxic adenoma and exophthalmic goiter. To support his contentions in this regard quotations are made from Richardson, Edling and Seilmann. In this same class comes the constitutional or idiopathic amenorrheas, menorrhagias and the metrorrhagias.

## ULTRA VIOLET ON CARCINOMA

**The Influence of Ultra Violet Radiation Upon the Takes and Growth of Transplantable Rat and Mouse Carcinomata in Albino Rats and Mice.** K. Sugiura, D. M. Sc., and Stanley R. Benedict, Ph. D., *Am. J. Roentgenol.*, 14: 234-240, September, 1925.

Because of the questionable effects of sunlight on the malignancy of transplanted tumor of the rat, studies were made on the effects of ultra violet radiation emitted from the quartz mercury arc lamp upon tumor susceptibility and growth in the albino rats and mice.

*In vitro* experiments indicate that the proliferating capacity of Flexpor-Jobling rat carcinoma was stopped by radiation in comparatively short exposures. This destructive action appears to be due to the selective absorption of the radiation by the cancer cells.

The results of irradiation of a malignant mass at a depth in the animal body by ultra violet radiation applied externally was summarized by the authors as follows:



1. The development of small tumors is checked by severe doses.

2. There is an increased rate of growth of malignant tumors after inadequate irradiation of small tumors.

3. Large tumors are seldom beneficially affected by radiation.

4. Radiation from a quartz mercury arc light does not confer resistance upon rats and mice to transplanted cancer.

### GERMICIDAL ACTION

#### A Radiometric Investigation of the Germicidal Action of Ultra Violet Radiation.

W. W. Coblentz and H. R. Fulton,  
*Am. J. Electroth. & Radiol.*, 43: 251-263, July, 1925.

In the present investigation an attempt is made to present the results on a radiometric basis, which seems to be the logical procedure in order to obtain some estimate of the germicidal action of different parts of the spectrum.

The subtractive and additive method of attacking the problem was used. The subtractive principle consists in eliminating different portions in the ultra violet spectrum by means of absorption screens. The additive principle, the use of which appears to be novel, is based upon the discovery of a well defined absorption band at about 260  $m\mu$  in mica. A small variation in thickness of the mica screen produces a large variation in transmission in this spectral region relative to the rest of the spectrum, in which the transmission remains practically constant.

The source of ultra violet radiation was a quartz mercury lamp. The test organism was bacterium coli communis suspended in sterile distilled water. This suspension was atomized uniformly over the surface of a Petri dish, containing hardened sterile beef peptone agar, and then exposed to ultra violet radiation.

In the preliminary tests it was found that exposure of the standard uninoculated beef peptone agar to ultra violet radiation, of the intensities and for the time of exposure used in this

investigation, had no effect upon the subsequently seeded surface. However, when using a very high radiation intensity, a subsequent seeding of the surface of the pre-exposed agar gave no growth, or only a small number of colonies of bacteria.

An investigation was made (1) of the spectral range of bacterial action, (2) of the effect of varying the intensity of the exciting light, and (3) of the method of exposure, whether continuous or intermittent.

From various experimental data it appears that germicidal action is produced by ultra violet radiation throughout the spectral range extending from the very short wave lengths (Schumann rays) to and including 365  $m\mu$ . The shortest rays have the most violent lethal action, which decreases in intensity with increase in wave length.

The long wave length limit of abiotic action is not well defined. Previous investigations have been interpreted as indicating that the long wave length limit of abiotic action is in the region of about 297  $m\mu$ . In the present investigation, when the time of exposure was sufficiently prolonged, killing of bacteria was obtained through screens which transmitted ultra violet radiation of wave lengths longer than 297  $m\mu$ , including the 365  $m\mu$  line. But no abiotic action was obtained through screens which transmitted only wave lengths longer than 365  $m\mu$  for the exposures used. The present tests, therefore, show that the long wave length limit of ultra violet abiotic action includes the wave length, 365  $m\mu$ , and explains the bactericidal action obtained in sunlight.

The lethal action of radiation of wave lengths longer than 305  $m\mu$  was found very slow in comparison with radiation of wave lengths less than 280  $m\mu$ , even though the latter was much lower intensity. Using the ultra violet radiation emanating from the quartz mercury arc, the lethal action of the wave lengths less than 280  $m\mu$  is estimated to be at least 10 times more rapid than that of the wave lengths greater than 305  $m\mu$ .

Tests were made to determine the abiotic action of ultra violet radiation when the total exposure is applied (1) continuously and (2) intermittently with short or long intervals of rest. No difference in the density of the growth of bacteria could be observed, whatever the method of exposure. From this it appears that the intermittent exposure does not have a latent effect, either in stimulating growth or in continuing the lethal action, during the intervals of rest, and that the killing effect is cumulative.

On low intensities the killing action is greatly retarded; for example, using an intensity of  $1 \div 50$ , it was necessary to expose the inoculated plate for seventy-five to eighty seconds instead of fifty seconds in order to secure the same killing effect as when using unit intensity and unit time. On still lower intensities there are some (although not thoroughly verified) indications of stimulation instead of lethal action.

It is shown that the energy value of the most active germicidal radiation from the quart mercury arc of wave lengths 170 to 280  $m\mu$  required to kill a bacterium is very small, being of the order of 19 by 10 watt or 4.5 by 10 g cal.

A further deduction is that, in order to produce a rapid abiotic action (in one second), the radiant flux of the germicidal radiation from the quart mercury arc must exceed a certain threshold value, which is of the 25 microwatts per square millimetre. This is obtained at a distance of about 15 centimetres or about six inches from a 110-volt mercury in quart arc lamp consuming about 320 watts or 80 volts and 4 amperes in the burner.

### ELECTRIC COAGULATION

**Electrothermic Coagulation: Its Indications and Limitations.** H. L. Northrop, M. D., F. A. C. S., *Am. J. Electroth. & Radiol.*, 43:127-132, April, 1925.

The writer's experience with the treatment of neoplasms by electrocoagulation has been rather extensive. Tumors involving the auricle, scalp,

various parts of the face, lower lip, tongue, jaws, cheek wall, tonsils, neck, hand, forearm, upper arm, female breast, buttock, groin, vulva, penis, perineum and anus, all have been treated by this method. In other words he applied high frequency method in destroying malignant disease on surface lesions which are not too close to large blood vessels and which can be removed in their entirety. In coagulating a malignant neoplasm, it is advisable to have direct access to it.

An outstanding fact in the experience of the writer is the large number of congenital moles presenting themselves for treatment. All are potentially sources of danger and should be removed before starting their activity. The cosmetic effect is also, from the viewpoint of the patient, a very important factor.

### CHRONIC OTITIS MEDIA

**Zinc Ionization in the Treatment of Chronic Purulent Otitis Media.** Carl E. Granberry, M. D., *New Orleans M. & S. J.*, 78:157-159, September, 1925.

Zinc ionization is the term that is applied to that form of treatment which consists in the introduction into the tissues of particles called ions by means of the electric current. The equipment is so constructed that a continuous electric current can be slowly turned on and measured as it passes through the patient. Preparation and after care of the patient is essential for success in this type of treatment the same as in any other method. In applying this measure to chronic purulent otitis media, the author reports of the 60 cases treated there was 80.6 per cent beneficial results.

### FAULTY HEARING

**Diathermy in Types of Faulty Hearing.** E. G. Linn, M. D., F. A. C. S., *J. Iowa State M. S.*, 15:540-542, October, 1925.

In this short article the author presents, after a brief discussion of the pathology existing in

the various types of middle ear disease, a series of case reports. They are so arranged as to illustrate the applicability of diathermy in the types of faulty hearing.

### BREAST CARCINOMA

**Breast Carcinoma.** W. Donald Nickelsen, M. D., *Medical Sentinel*, 34:9-19, January, 1926.

In the treatment of operable cases of carcinoma of the breast, a combination of radium and radical surgery is a most encouraging one. In all cases a preoperative and postoperative cycle should be employed if the best results are to be obtained.

The technique used by the author in the radium application to these operable cases is to push the dosage of radium to the skin tolerance. This is done by the use of a block 2 mm. wide, 5 mm. long and 2 mm. thick, surrounded by a sheet of lead 1 mm. in thickness; 100 milligrams of radium in the form of needles or tubes are placed on this block and a heavy thickness of lead which covers the slides well is used as a lid. This is left in place as per area for 1,000 to 1,200 mg. hours. Operation is done from four to six weeks later. Postoperative radiation is done one month later over the area; axillary and supraclavicular regions being treated to the full skin tolerance.

Treatment of hopelessly inoperable and recurrent cases consists of application of radium blocks as previously described, over the mass and in the axillary and supraclavicular regions—followed in from three to four weeks by insertion of radium needles in the tumor mass. Skin nodules are also treated by insertion of radium needles; 10 milligram needles are inserted one cm. apart in a circular manner, giving five to ten hours' exposure.

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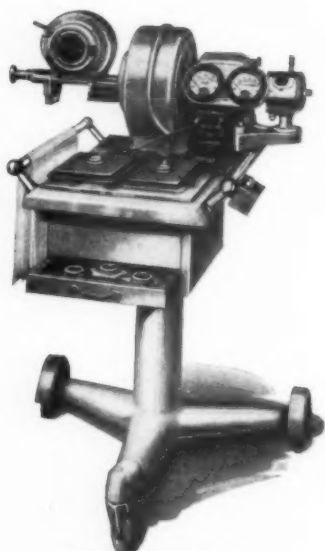
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